University of Alberta

SOCIOECONOMIC STATUS, SENSE OF COHERENCE, AND HEALTH IN CANADIAN WOMEN

BY

JOAN D. ING ©

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Abstract

The social and economic environment is recognized as a powerful determinant of the health of Canadian women. The purpose of this study is to explore the role of sense of coherence (SOC) in the relationship between socioeconomic status (SES) and health among Canadian women. These associations are examined using the data from the 1994-95 National Population Health Survey. Results are based on a sample of 6,747 women aged 20-64. Path analyses indicate that SOC mediates the relationship between SES and health when SES is measured by each of the indicators of income, education, and occupation. No statistical interaction was identified between SOC and income, or between SOC and education, but a small interaction effect between occupation and SOC was detected. Results from this analysis suggest that SOC is a psychosocial factor that intervenes in the SES and health relationship, but SOC does not function as an interactive buffer to ameliorate the adverse effects of low SES on self-rated health. Implications for research and for public health nursing practice are discussed.

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CHAPTER 1

INTRODUCTION

The link between socioeconomic status (SES) and health has been observed throughout the world and over the centuries (Syme & Berkman, 1976; Williams, 1990). In Canada this association has not gone unnoticed (Epp, 1986; Lalonde, 1974). In 1986 the Honorable Jake Epp (1986) released a paper entitled *Achieving Health for All: A Framework for Health Promotion* which described the need to "find ways of reducing inequities in health of low- versus high-income groups in Canada" (p. 4) as a national health challenge. This challenge, coupled with the 1st International Conference on Health Promotion that resulted in the publication of the *Ottawa Charter on Health Promotion* (World Health Organization [WHO], 1986), formalized the Canadian socio-ecological approach to health which links the individual's health with his or her environment. The social and economic environment is now recognized to be a powerful determinant of the health of Canadians (British Columbia Provincial Health Office, 1994; CPHA, 1997).

In the period since the release of the Ottawa Charter, other international conferences and meetings have continued to examine the social, economic, and political determinants of health. The 3rd International Conference on Health Promotion in Sundvall, Sweden, in 1991 emphasized the need for a supportive environment for health where people live, work, and play; and the 4th International conference on Health Promotion in Jakarta (WHO, 1997) built on the prerequisites for health that were first described in the Ottawa Charter (WHO, 1986). This conference proclaimed poverty as the greatest threat to health. The prerequisites for health as outlined in the Jakarta Delcarion include peace, shelter, social security, social relations, food, income, empowerment of women, a stable ecosystem, sustainable resource use, social justice, respect for human rights, and equity. A challenge was issued to tackle these health determinants in the 21st century.

Gender is also considered a determinant of health (Kaufert, 1996). Social, economic, and political factors influence the health of all Canadians, but because women are disproportionately located at the lower end of the socioeconomic hierarchy, the impact of these determinants on Canadian women is particularly relevant (Cohen, 1994; Kaufert, 1996; Love, Jackson, Edwards, & Pederson, 1996; Reutter, Neufeld, & Harrison, 1996). Social and economic factors may affect men and women differently, prompting research on the determinants of health that considers gender (Lefebvre, 1996; Love et al., 1996). Research has revealed a difference in Canadian women's health across the socioeconomic groups (Adams, 1993; Clarke, 1996; Health Statistics Division, 1995a), yet most of the research addressing SES and health in women is conducted outside of Canada. Because the social, economic, and political circumstances in which women live, work, and play vary from country to country, research that examines the effect of these factors on the health of Canadian women is important (Reutter, Neufeld, & Harrison, 1996).

Many theories have been developed to explain how the social and economic conditions affect health, and a variety of psychosocial, behavioral, biological, and environmental factors have been proposed as influencing this relationship (Labonte, 1993; Williams, 1990). The exact mechanism of influence, however, often remains undetermined. One factor that has received only limited attention in the exploration of the relationship between SES and health is a sense of coherence (SOC).

The search for salutogenesis, or the origin of health, led Aaron Antonovsky (1979) to a belief in the construct he called a "sense of coherence." A sense of coherence is described as a global orientation that enables one to perceive events of the world as comprehensible, manageable, and meaningful (Antonovsky, 1996a). The salutogenic theory suggests that the strength of one's SOC facilitates the movement toward health (Antonovsky, 1996b).

Studies from a variety of populations have supported Antonovsky's (1996a) speculated link between SOC and health. A relationship between SOC and health has been found when health has been operationalized by various measures of mental, physical, and overall health (Antonovsky, 1993; Antonovsky, 1996b; Coe, Romeis, Tang, & Wolinsky, 1990; Nyamathi, 1991). Research results have shown that those with a strong SOC are healthier than those with a weaker SOC (Antonovsky, 1996b; Coe et al., 1990; Nyamathi, 1991). Evidence of this correlation sparks an interest in exploring the factors that influence the development of a strong SOC, as well as the mechanism by which SOC could influence health.

If SOC does promote health (although Antonovsky [1996a] recognized the difficulty in determining causality), then how does it work? From studies with Holocaust survivors, Antonovsky (1979, 1987) contended that those with a strong SOC experience hardship while remaining healthy. He suggested that in comparison to those with a weak SOC, persons with a strong SOC are more likely to perceive events as nonstressors or to believe that they can adapt to the demand imposed by the stressor (Antonovsky, 1987). SOC, then, is proposed to work by preventing "tension from being transformed into stress" (p. 135) because events are perceived as manageable, comprehensible, and meaningful; and the appropriate strategy or resource is selected and mobilized to meet the demand. Antonovsky (1987) hypothesized that damage to persons with a strong SOC may also be averted through mobilization of neuroimmunological and neuroendocrinological resources. Thus, a strong SOC may work to protect the individual from the effects of life's inevitable hardships or stressful events.

Three types of life experiences are said to shape one's SOC: consistency, underload-overload balances, and participation in socially valued decision making (Antonovsky, 1996a). According to Antonovsky, these experiences are molded by one's position in the social structure and by culture. Antonovsky's speculation prompts the question of the relationship between SES and SOC. Those with inadequate financial or educational resources may experience living and working conditions that are not conducive to the development of a sense of comprehensibility, manageability, and meaningfulness. A low SES could be related to a weak SOC. Perhaps there is a socioeconomic gradient in SOC as well as in health.

Psychosocial factors, such as stress, social support, perceptions of control, and health behaviors, have been described by Williams (1990) as potential intervening variables through which social stratification influences health. If social and economic environments influence the formation of SOC, which in turn affects health, then SOC could be added to the list of psychosocial factors that act as intervening variables in the relationship between SES and health.

Low SES has been associated with hardships and stressful events. Canadian women with few economic and education resources suffer from the fears and concerns that arise from a lack of money for basic needs (Seguin, Potvin, St.-Denis, & Loiselle, 1995). Economically disadvantaged women may also be employed in occupations that require few skills, offer few challenges, and provide little opportunity for autonomy or for meaningful participation in society. Perhaps SOC acts as a buffer, or a moderator variable (Wheaton, 1985), by attenuating the negative impact of low SES on health. If SOC acts as a buffer, then the SES and health relationship would vary as a function of SOC.

Knowledge of the relationship of SES, SOC, and health in Canadian women has implications for public health. Because one of the stated priorities of health promotion in Canada is to reduce inequities in health (Epp, 1986), the identification of the factors that influence the relationship of socioeconomic status (SES) and health could have implications for both individual and population health. If SOC is found to moderate the deleterious effects of low SES on health, then communities and health workers could work together to create environments that strengthen SOC. If SOC is found to be socially patterned, then another explanation for the socioeconomic health gradient could be put forward. Although psychosocial factors do not provide the entire explanation for the socioeconomic/health gradient, the recognition that salutogenic factors such as SOC are socially patterned would underscore the importance of health promotion strategies that focus on the social and environmental context in which individuals live (Labonte, 1993). More specifically, public health practitioners need to advocate for living and working conditions that enhance both health and SOC.

Statement of the Problem

There is a paucity of research on the relationship of SES, SOC, and health. Although there is a theoretical basis for an association between SES and SOC (Antonovsky, 1996b), empirical evidence of this correlation has been limited. Identification of the structural sources of SOC might be obtained by using SOC as a dependent variable, yet few studies have been conducted this way. Research studies that include both SOC and socioeconomic indicators have tended to use education, income, and occupation as control variables (Anson, Rosenzweig, & Shwarzmann, 1993; Midanik, Soghikian, Ransom, & Polen, 1992) rather than as variables to be studied. A few studies, however, have reported a positive correlation between the SES indicators of education, income, and occupation with SOC (George, 1996; Hood, Beaudet, & Catlin, 1996). Education, however, has not been shown to be associated with SOC in all studies (Hood et al., 1996; Nyamathi, 1993).

The mechanism for the influence of SOC on health has been studied, but with few conclusions or consistent results. It has been shown that those with a strong SOC perceive events as less threatening (Antonovsky, 1986; George, 1996; Nyamathi, 1993). Thus, SOC may indeed operate through the primary appraisal of stressors, contributing to the perception of the environment as being less of a threat to well-being. The author of a study of SOC in homeless minority women described the SOC as a “shield” (Nyamathi, 1993) from the effects of the environment. The protective role of a SOC, however, has not yet been confirmed. Sense of coherence has not been found to buffer the effects of stress on depression or psychological distress (Flannery & Flannery, 1990), nor the effects of recent life events on health (Carmel, Anson, Levenson, Bonneh, & Maoz, 1991; Hood et al., 1996). The role of SOC as a buffer to the socioeconomic effects on health has not yet been empirically studied.

The relationship of the socioeconomic indicators of education, income, and occupation with SOC and health has not been studied for Canadian women. Multivariate analysis using both health and SOC as dependent variables could contribute to the knowledge of this relationship.

Purpose of the Study

The purpose of this study was to explore the relationship between SES, SOC and health in Canadian adult women by using the 1994-1995 National Population Health Survey.

Research Questions

The following research questions were addressed:

1. Is SOC an intervening variable in the SES and health relationship?
2. Does the relationship between SES and health vary as a function of SOC?

Definition of Terms

Sense of Coherence

Sense of coherence (SOC) is defined as

> a global orientation that expresses the extent to which one has a pervasive, enduring though dynamic feeling of confidence that (a) the stimuli deriving from one's internal and external environments in the course of living are structured, predictable, and explicable; (b) the resources are available to one to meet the demands posed by these stimuli; and (c) these demands are challenges, worthy of investment and engagement. (Antonovsky, 1987, p. 19)

These three core components of SOC are called comprehensibility, manageability, and meaningfulness, respectively. Sense of coherence was measured by the scores of the Orientation to Life Questionnaire (SOC-13) developed by Antonovsky (1987).

Health

The *Ottawa Charter for Health Promotion* (WHO, 1986) described health as a "positive concept emphasizing social and personal resources, as well as physical capacities." Therefore health is more than the absence of disease and includes aspects of physical, mental, and social well-being. To achieve health, "an individual or group must be able to identify and to realize aspirations, to satisfy needs, and to change or cope with the environment" (WHO, 1986).

In this study, self-rated health was used as an indicator of health. Self-rated health is the respondent's perception of his or her own health and was measured by the response to the question, "In general, would you say that your health is excellent, very good, good, fair, or poor?" (Health Statistics Division, 1995b). The definition of health that the individuals use to rate their health is unknown, but they may have considered their physical, mental, and social well-being.

Socioeconomic Status

The term *socioeconomic status* (SES) is used to describe the "inequality in ranking that exists in society" (Williams, 1990, p. 83). This stratification results in differences in opportunities, resources, and quality of life (Link & Phelan, 1995; Ross & Wu, 1995). Income, education, and occupation are dimensions of social stratification (Liberatos, Link, & Kelsey, 1988; Williams, 1990) and are commonly used as indicators of SES. In this study, SES refers to one or more of the three indicators of income, education, or occupation.

Income. *Income* is an indicator of SES. It has been described as a proxy for the measure of quality of life (Wilkinson, 1996), material circumstances (Arber, 1990), and access to and control over resources (Macran, 1996). In this study, income is measured by a five-category derived variable of household income adequacy, which is based on the total household income and the number of household members.

Education. *Education* is an indicator of SES and is considered to be a dimension of SES that structures income and occupation (Ross & Wu, 1996). In this study, educational attainment is a 12-category derived variable based on attendance and completion of educational programs.

Occupation. *Occupation* is an indicator of SES. The respondent's occupational status was ranked according to the Pineo socioeconomic classification system. The derived 16-category variable is based on the respondent's main job in the previous 12 months.

Marital Status

In this study, current *marital status* was grouped into three categories: married/common-law/partner, single, and widowed/divorced/separated.

Adult Women

Females who are 18 years and older are considered *adult women*. In this study, however, because the age variable is released in cohorts, the adult women included in this study will be between the years of 20 and 64, inclusive.

Intervening Variable

An *intervening variable* is a variable that is dependent on some other variable but is also a cause of another dependent variable. In this study, SOC would be an intervening variable if it was dependent on SES and was also a variable that influenced self-rated health. In this thesis, the terms *intervening* and *mediating* are used synonymously.

Moderator Variable

The terms *moderator* and *buffer* will be used interchangeably in this study. Sense of coherence will be considered a moderator if it interacts with SES and reduces the adverse effect of low SES on health.

CHAPTER 2

REVIEW OF THE LITERATURE

This chapter will provide an overview of the literature that addresses relationships among SES, SOC, and health. The literature review is organized into four main areas: the relationship between SES and health, SOC, the association between SOC and health, and the association between structural factors and SOC. The review begins with a brief introduction of the influence of gender, or, more specifically, the influence of being female, on SES.

It is well documented that SES is a determinant of health; health inequities have been found to be associated with disadvantages in education, income, and occupation. Women, however, may be multiply disadvantaged, for not only is gender itself a determinant of health (Kaufert, 1996), but women are also more likely to belong to the low SES group. Therefore, women's roles "amplify structural inequalities" (Arber, 1990, p. 37).

One of the determinants of poverty (as measured by Statistics Canada low income cutoffs) in Canada is family type. In 1996 single-parent mothers were found to have the highest poverty rate (61.4%) (and for women under 25 years, this rate rises to 91.3%), followed by unattached women over 65 years (45.4%) and unattached women under 65 years (39.5%) (National Council of Welfare, 1998). Although women of all ages are more likely to be poor compared to their male counterparts, the greatest gender discrepancy is between older unattached women (45.4%) and older unattached men (29.3%). Women's poverty is thought to be more visible because an increasing number of women are living without men (Cohen, 1994). Thus, although they are not the only Canadians living with low incomes, women are particularly subject to the effects of an unstable or inadequate income (Vanier Institute of the Family, 1994).

Canadian statistics also indicate that education is related to poverty (National Council of Welfare, 1998). Individuals with a university degree have a lower rate of poverty than those with less education. The poverty rate for single-parent mothers with less than high school education is 87.2%, compared to a rate of 51.8% of those who completed high school. There is a reciprocal relationship between education and poverty, however, because poverty may also influence educational opportunities. Family circumstances such as pregnancy and motherhood may contribute to departure from high school (National Council of Welfare, 1995), and single parenthood may limit opportunities to return to school.

The number of women participating in the labor force has steadily increased since World War II., and today the majority of women are employed (Vanier Institute of the Family, 1994). However, the average employment earnings for women in 1993 was only 72% of the earnings of men (Kaufert, 1996). This may be related to gender difference in either pay or occupation because women earn less than men at all levels of educational attainment (Kaufert, 1996). Women's employment in lower-paying jobs may also accommodate their need for flexibility to attend to family circumstances (McDaniel, 1993). McDaniel described women who place childcare and family care over their own education and occupation as being "scripted to care" (p. 170). This "script" may also structure women's economic security and SES.

Socioeconomic Status and Health

The link between SES and health has been documented for centuries. Although there is some randomness in health, illness, and length of life, historical records point to inequities across social groups (MacIntyre, 1994, 1997). Variations in death, disease, and illness have been observed to be socially patterned (Link & Phelan, 1995), and the range of conditions related to SES suggests that it is a social phenomenon, not merely a spurious association with a few risk factors (Wilkinson, 1996). Not only is the health differential evident between the highest and the lowest social group, but research has also accumulated which points to a socioeconomic gradient in health (Adler et al., 1994; Canadian Public Health Association, 1997; Health Statistics Division, 1995a; MacIntyre, 1994). This linear association between SES and health is important to consider in the exploration of the pathways which produce the socioeconomic differentials in health.

The social and economic environment continues to be considered an important determinant of health for Canadians living in the 20th century. Health inequities remain despite changes in disease patterns, advances in modern medicine, institution of public health measures, and the introduction of universal access to health care (Canadian Public Health Association, 1997; Shah, 1994). The accumulation of Canadian evidence of the health impacts of socioeconomic status on the working poor, the unemployed, children, families, women, and seniors (BC Ministry of Health, 1994; CPHA, 1997; D'Arcy & Siddique, 1985; Mustard & Roos, 1994; Reutter, in press; Roberge, Berthelot, & Wolfson, 1995) supports socioeconomic factors as determinants of health.

The Utility of the Socioeconomic Status Indicators

Although much of the research in health is concerned with socioeconomic status as either a confounder, risk factor, or explanatory variable of health status, the various measures of socioeconomic status were developed primarily by sociologists in an attempt to quantify relative position in society (Liberatos et al., 1988). The term *socioeconomic status* is used to describe the "inequality in ranking that exists in society" (Williams, 1990, p. 83). Liberatos et al. traced the development of the socioeconomic indicators to the views of social class held by Karl Marx and Max Weber. Marx emphasized economic inequality, but Weber rooted societal position in three separate but related dimensions of class, status, and party (or power). Weber's notion of class has an economic base, status captures the prestige or honor in the community, and party has a political aspect.

Three indicators of socioeconomic status measures (income, occupation, and education) are commonly used in North America. These indicators are conceptually linked to Weber's class and status dimensions and, like his dimensions, are intertwined. Each of the three SES indicators has utility in the investigations of the SES-health relationship and has also been used in the investigation of the socioeconomic differentials in health in women.

Income has been described as a proxy for the measure of quality of life (Wilkinson, 1996), as well as access to and control over resources (Liberatos et al., 1988; Macran, 1996). From her studies of women, Arber (1990) has concluded that income, and in particular household income, has utility as a measure of material circumstances. The influence that income has on opportunities for education as well as access to different lifestyles and prestige are examples of how income overlaps with the education and occupation dimensions (Liberatos et al., 1988), and thus may be a descriptor for something other than material circumstances.

Educational attainment is considered a stable, robust, and universal indicator of SES (Ross & Wu, 1996; Williams, 1990). Because education often precedes occupation and income, it is thought that education is the socioeconomic dimension least affected by health; it is therefore used when there is concern for the establishment of the causal order of events. Ross & Wu (1995) described education as the SES dimension most important to health because it structures both occupation and income; therefore it is the "key to one's position in the stratification system" (p. 720). Education can therefore be used as a proxy for either economic resources or for lifestyle and social networks (Liberatos et al., 1988). Education has been found to be a useful SES indicator for women because education is less likely to be influenced by the occupational downgrading that can occur for women subsequent to leaving the labor market to assume family responsibilities. Education also has utility as an indicator of health in unemployed women (Arber, 1996).

Occupation can be ranked by two approaches (Liberatos et al., 1988). The prestige perspective reflects the public opinion of the occupation's level of esteem in the community. The socioeconomic approach ranks occupation according to the educational requirements and monetary benefits. Thus, occupation can be linked to both the status and class domains of Weber's social class conceptualization.

The use of occupation as an SES indicator in women is complicated by the difficulty in classifying women who are not currently employed (Arber, 1990; 1996; Najman, 1993; Ross & Wu, 1995). The alternatives to using current occupation for the nonemployed are to use the occupational class of the head of the household, use the individual's last main occupation, classify the individual as homemaker, or exclude the nonemployed from the analysis (Arber, 1996). Arber argued that the last occupation should be used for the unemployed because the exclusion of this group from analysis weakens the observed class inequalities. She contended, however, that using the previous occupational class provided "fewer clues" about unemployed women's health than it does about men's.

Which of the SES indicators is best to use to study health has not yet been determined (Liberatos et al., 1988). Some researchers have chosen to use income or education because of the ramifications for social and educational programs (Najman, 1993; Ross & Wu, 1995). Education may also be favored because of the strong direct effect on health as well as the indirect effect on health through jobs and income (Ross & Wu, 1995). Yet the indicators of SES may not all be measuring the same concept; rather, it is thought that they are measuring many dimensions of social stratification that are synergistically related (Liberatos et al., 1988). This supports the evidence that some diseases and health outcomes are related to different SES indicators (Arber, 1996; Cairney & Arnold, 1998; Liberatos et al., 1988).

Empirical Evidence for the Association Between SES and Health

Income. The ubiquitous observation of the relationship between health and income has prompted one observer to ask if they call it "poor health" for a reason (Shweder, 1997). In 1991, 79% of Canadian women from the lowest income adequacy category reported health problems, in contrast to 60% of those in the highest income groups

(Statistics Canada, 1994). The 1994-95 National Population Health Survey also reported an income and health relationship (Health Statistics Division, 1995a). In this survey, 74% of women in the highest household income group described their health as excellent or very good compared to only 51% of women in the lowest income adequacy group. A difference in the proportion of women reporting excellent or very good health was also evident between each of the household income groups, providing additional evidence for the socioeconomic gradient in health. Using the 1991 General Social Survey on Health, Cairney & Arnold (1998) studied socioeconomic position and health in working aged Canadians (18-64 years). They found that income was significantly related to emotional disorders, migraines, respiratory problems, stomach ulcers, arthritis, digestive problems, and self-rated health when the effects of 'risky' lifestyle behaviors, education, and occupation were controlled.

Education. The positive relationship between educational attainment and health has been observed using a variety of statistical methods (Ross & Wu, 1995). In a British study of women between the ages of 20 and 59, Arber (1996) noted that the odds of "poor health" (a category of self-rated health) were 2.47 times greater in women without postsecondary education than in those with a university degree. Although education was previously disregarded as a SES indicator, this 1991-92 British General Household survey showed that educational qualifications showed a sharper gradient than did occupational class for women's self-assessed health. The authors of a Norwegian study of women also noted an appreciable correlation (.30) between years of schooling and self-reported health (Fylkesnes & Forde, 1992).

Canadian studies have also employed education as an SES indicator in the analysis of inequalities of health (Shah, 1994). The 1994-95 National Population Health Survey (Health Statistics Division, 1995a) revealed an association between health and education in the Canadian population. Seventy-two percent of those individuals who completed postsecondary education described their health as either excellent or very good, compared to only 49% of those without postsecondary education. The positive correlation between educational attainment and self-rated health remained when self-rated health was regressed on the demographics variables of age, income, education, race, and marital status (Hood et al., 1996). In Canadian women, the results from the 1991 Canadian General Social Survey revealed a deterioration of health with age that was influenced by education. The influence of education on health status, measured by the health status index (HSI), became apparent at age 45 and continued throughout the older age groups (Roberge, Berthelot, & Wolfson, 1995).

Occupation. Much of the research connecting occupation with health has been conducted in the UK, where by long tradition social class has been defined by occupation (Marmot, Kogevinas, & Elston, 1987). Evidence of the SES gradient on women's health when their last or current occupation was used (Arber, 1996), as well as the interest in occupation as a determinant of health sparked by the British Whitehall studies of British civil servants (Evans, 1994), prompts further investigation of health differentials using occupation as an SES indicator. The Whitehall studies, conducted in one occupational setting with one employer and in the absence of exposure to a hazardous physical work environment, proved useful in examining the effects of a social hierarchy on health. These studies examined the mediating effects of psychosocial factors on the relationship between social position and morbidity and mortality (Marmot et al., 1987).

Reports from the British Health and Lifestyle Survey (Macran, Clarke, & Joshi, 1996) and the British General Household Survey (Arber, 1996) reveal that women whose current or last occupation was in the nonmanual occupations (such as professionals, teachers, nurses, or clerical workers) had significantly better self-assessed health than women in the unskilled reference group. This effect continued when income and education were entered into the models (Macran et al., 1996).

Although Canada has produced studies linking exposure to biological, chemical, and physical agents in the work environment to specific diseases (Shah, 1994), few

Canadian studies have used occupation as an SES indicator in the investigation of social patterning of health and illness (Cairney & Arnold, 1996, 1998). Using the 1991 General Social Survey for adults over 65, Cairney & Roberts (1996) collapsed the Pineo, Porter, and McRoberts classification of the respondents' last occupation into six categories: professionals, managers and technicians, skilled, semiskilled, unskilled, and homemakers. Using logistic regression, the occupation categories were significantly related to self-rated health when entered as a set of predictors. Using the same survey, but with 18- to 64-year-olds, the analysis revealed that only the occupations of farmers and nonemployed were related to any of the health conditions (Cairney & Arnold, 1998). However, in this same data set Roberge et al. (1995) revealed a differential in health (measured by the health status index) between the unskilled female workers aged 35 to 64 and their skilled or professional counterparts.

Explanations for the SES-Health Relationship

The Black Report published in 1980 in Britain outlined four explanatory models for inequalities in health. These explanations, referred to as the *artifact, social selection, behavioral,* and *materialist/structuralist* explanations, have continued to stimulate discussion (MacIntyre, 1997). The artifact explanation highlights the difficulty in measuring social phenomenon and thus raises the possibility that the observed relationship, or at least the magnitude of the relationship, may depend on the data. The social selection explanation, sometimes called the 'drift' explanation, contends that the health of the individual can influence his or her socioeconomic class; thus there is a downward drift in status due to poor health. The cultural/behavioral explanation, on the other hand, suggests that the socioeconomic status does influence health, evident by the social patterning of health damaging behaviors. Thus, the chosen lifestyle of individuals and the personal decisions that they make mediate the socioeconomic status and health relationship. MacIntyre (1997) suggested that although the Black Report working group recognized the role of these three explanatory models, they espoused the materialist/structuralist explanation as being the main explanatory model of the inequities in health.

The materialist/structuralist explanation recognizes the role of economic and social factors in the distribution of health and well-being. The physical or material conditions of life, largely influenced by economic resources, produce differences in health. But the authors of the Black Report acknowledged the role of the other dimensions of occupational class that also affect health, such as the degree of job stability and security, job satisfaction, and a physically and mentally stressful environment (MacIntyre, 1997). Support has grown for the identification of mechanisms other than the lack of material resources that contribute to the relationship between social status and health (MacIntyre, 1994). Investigators have been searching for factors that account for the differentials in health observed throughout the SES hierarchy, not simply the correlates of poverty (Adler, 1994; Link & Phelan, 1995; Wilkinson, 1996). Evidence of the socioeconomic gradient in health has pushed for explanations that go beyond material deprivation and access to resources to explanations that include the role of psychosocial factors.

Williams' (1990) model of the pathways through which SES influences health includes the role of psychosocial factors. Psychosocial factors, such as stress, social support, perceptions of control, and health behaviors are described as the intermediate mechanisms, or the pathways through which the effects of social stratification are mediated to the individual. This model is congruent with the socioecological or socioenvironmental view of health that recognizes the social and environmental context in which individuals live and incorporates psychosocial risk factors and socioenvironmental risk conditions (Labonte, 1993). One factor that may be included in the list of psychosocial factors is sense of coherence (SOC), a construct first described by Antonovsky (1979).

Sense of Coherence

Antonovsky (1987) was intrigued with the question, "What moves people along the continuum toward health?" His curiosity was piqued as he interviewed Holocaust women survivors and discovered that despite unimaginable hardships in their lives, some continued to be healthy. Antonovsky (1996b) described a salutary factor, or a factor that promotes the movement toward health, that he called a *sense of coherence* (SOC). SOC may provide part of the explanation of how, in a world full of crisis, chronic burdens, and stressful events, some people are able to find "order out of chaos" and remain healthy. In his search for the crucial elements of the SOC, Antonovsky (1987, 1996b) untangled three threads: comprehensibility, manageability, and meaningfulness. These interrelated components combine to create a global orientation to life, or a way of viewing the world with a belief "that things will work out as well as can reasonably be expected" (Antonovsky, 1987, p. xiii).

Comprehensibility is the component of SOC that allows one to make sense out of events in the world. Stimuli from the internal and external environments are perceived as ordered or structured, rather than chaotic (Antonovsky, 1987). Events are thus viewed as predictable or, if unexpected, explainable. Comprehensibility arises from "knowing the rules of the game" (Ryland & Greenfield, 1991, p. 41).

Manageability is the perception that there are sufficient resources available to meet demands (Antonovsky, 1987). These resources may be controlled by the individual or by a legitimate other. The belief in the availability of resources that are controlled by oneself, a spouse, a family member, friends, colleagues, or God is germane to the perception of manageability.

Central to the SOC is the component of meaningfulness, the motivational element of SOC. It describes the extent to which the game is considered "worthy of playing" (Ryland & Greenfeld, 1991). Those with a strong SOC will have areas of life about which they care or to which they are committed. Problems are considered challenges, and demands are worthy of the investment of time and energy, as "life makes sense" (Antonovsky, 1987, p. 18).

The three components are all essential, yet some components take on greater importance. Meaningfulness is crucial to a SOC. Without this caring or commitment, comprehensibility and manageability are soon at risk because there is no motive to seek understanding and to search for resources (Antonovsky, 1987). And, without an understanding of the demand, or comprehensibility, it is unlikely that one can consider the available resources and assess manageability. Despite the differential importance of each component of SOC, however, Antonovsky believed that successful coping with the ubiquitous stressors in life depends on the SOC "as a whole" (Antonovsky, 1987, p. 22), and it is this successful coping that is the link between SOC and health.

Sense of Coherence and Health

As a broad construct, salutogenesis seeks to understand health. Sense of coherence provides an explanation for how a multitude of resources contribute to health. Because there is no one resource that is effective in all situations, a strong SOC enables individuals to select and mobilize the appropriate resource to deal with the demand that is encountered. These resources are labeled *generalized resistance resources* (GRRs) and include material resources such as wealth; personal resources such as knowledge and intelligence; and community and family resources such as social support, cultural/ community identity, and stability (Antonovsky, 1987).

The salutogenic theory suggests that the strength of one's SOC facilitates the movement toward health (Antonovsky, 1996a). Studies from a variety of populations have confirmed this hypothesis by using various measures of mental health (Carmel et al., 1991; Dahlin, Cederblad, Antonovsky, & Hagnell, 1990; Dangoor & Florian, 1994; Ryland & Greenfeld, 1991), physical health (Carmel et al., 1991; Coe et al., 1990), and self-rated health (Hood et al., 1996).

Research has also supported an association between health and SOC in the Canadian population, and authors have noted very little difference in the SOC distribution by gender (Hood et al., 1996). Three measures of health were used in the 1994-1995 Canadian National Population Health Survey (NPHS): health utility index, self-rated health, and chronic conditions. Although there were differences in the strength of the associations, SOC is correlated with all of these health measures. The health utility index, which incorporates the self-rated function of eight areas of personal health, has the strongest correlation with SOC (.31), followed by self-rated health (.21) and number of chronic conditions diagnosed by a health professional (.10). The NPHS is reported to be the first large-scale survey to incorporate a measure of SOC, and holds promise for future study.

Most of the SOC literature has been based on cross-sectional surveys (Antonovsky, 1993; Geyer, 1997). This research method has limitations, specifically the inability to determine causality. Does a strong SOC lead to perceived good health and to situations that promote health, or do these factors strengthen SOC? Antonovsky (1996b) also acknowledged the nonstatic property of SOC and the role of health as a life situation that can strengthen or debilitate the SOC (Antonovsky, 1987, p. 162). Although the NPHS 1994-95 is a cross-sectional survey, Statistics Canada has incorporated a longitudinal component. This may allow for future study to address the concerns of causal order in the relationship between SOC and health.

The evidence of an association between health and SOC prompts the question, How does a strong SOC promote health? Antonovsky (1987) believed that the discussion of the mechanism of the effect of SOC on health needs to include the role of stressors, tension, and coping. Health status is hypothesized to be reinforced or improved by the successful management of tension. Antonovsky (1996a) believed that whatever the life situation, the person with a strong SOC is more likely to prevent tension from being transformed into stress by mobilizing emotional and cognitive intra- and interpersonal and material resources to cope with problems, as well as neuroimmunological and neuroendocrinological resources through the central nervous system, which prevents damage to the organism (Antonovsky, 1987, p. 160). Sense of coherence also affects the appraisal of stimuli. The individual with a strong SOC is more likely to define a stimulus as a nonstressor, or if it is considered a stressor, to regard it as benign.

There is increasing empirical support for the contention that SOC influences appraisal. In a study of home health care workers, George (1996) found that those with a strong SOC perceived the environment to be less threatening than did those with a weak SOC. A negative correlation between SOC and trait anxiety (a chronic disposition to react with anxiety) confirmed Antonovsky and Sagy's (1986) hypothesis that a person with a high SOC would perceive situations as less anxiety arousing. Nyamathi's (1993) study of the relationship of SOC, concerns, appraisal of threat, and emotional distress in minority women at high risk for HIV infection revealed that women with a strong SOC perceived their concerns and threats as less serious than did those with a weak SOC. Using path analysis, Nyamathi found that the relationship between SOC and distress was mediated by the women's appraisal of threat from the environment. These studies supported the hypothesis that the more one perceives one's world as predictable, manageable, and comprehensible, the more likely one is to perceive events and situations as nonthreatening.

Antonovsky (1996a) raised the question of whether SOC acts as a buffer. The term *buffer* has been used in stress research to refer to a resource that reduces the impact of social stressors on health outcomes. One of the models that depict this stress-buffering effect is the interactive effect buffering model. In this model, stress has less impact on health when the coping resource is present (Wheaton, 1985). Whereas the main effect model describes an overall beneficial effect of the resource, the buffering model predicts a protection from the adverse effect of stress. Thus, individuals with low SES and low SOC will show disproportionately poorer health than those with low SES and high SOC (Cohen & Wills, 1985).

The literature describes two methods to detect an interaction. One method is to model interaction in a multiple regression with a multiplicative term (Cohen & Wills, 1985; Hayduk & Wonnacott, 1980; Wheaton, 1985). Another way to identify an interaction is to compare regression lines of different levels of the coping resource as the control variable (Agresti & Finlay, 1986).

The moderating effect of sense of coherence has been tested in a number of studies using multiplicative interaction terms. In an American sample of adult evening college students, SOC was not found to buffer the effects of life stress on psychological distress (Flannery & Flannery, 1990). An Israeli study explored the relationship between recent life events (RLE), SOC, and measures of health for men and women living on a kibbutz (Carmel et al., 1991). When psychological well-being, physical well-being, and functional ability were each regressed on sex, age, RLE, and SOC, SOC reduced to a small extent the negative effect of RLE on health; however, the interaction term of RLE and SOC was not statistically significant. The authors concluded that SOC did not buffer the effect of life events on health.

Canadian researchers have used the National Population Health Survey to explore the relationship of stress events, SOC, and health by using interaction variables of SOC with recent life events and with traumatic events during childhood or young adulthood (Hood et al., 1996). The interaction variable (life events x SOC) was significant for the regressions in only one of the three health measures (health utility index). The authors suggested that the nonsignificant findings for the other health variables may be related to the recent life events measure, which included events that occurred to the subject and to those "close" to the respondent. The interaction variable (traumatic events x SOC), however, was significant for all of the health measures. Further analysis found that those who were exposed to trauma in childhood had a lower mean health utility score than those who were not, but the difference between the groups was greater for those with a low

SOC. The authors concluded that a strong SOC diminished the impact of traumatic events during childhood on health.

Structural Factors and Sense of Coherence

The evidence for an association between SOC and health has resulted in a search for the factors influential in the development of SOC. What are the sources of SOC? Antonovsky (1987, p. 127) speculated that SOC develops as a result of life experiences that provide consistency, an underload-overload balance of stimuli, and participation in socially valued decision making. The family, community, and society may pattern these life experiences. These life experiences are often structurally or socially patterned, hence providing the link between SES and SOC.

Family and Community Influences in Early Life

Antonovsky (1987) and Ryland and Greenfeld (1991) considered the life experiences of childhood, adolescence, and the first decade of adulthood to be crucial to the formation of SOC. Antonovsky (1996b) suggested that a person's SOC is more or less stabilized by the age of 30, the time at which one has spent a number of years in the work and family situation of one's culture and subculture. Support for the contention that SOC is relatively stable by the age of 30 is difficult to ascertain in the cross-sectional studies. Some studies have noted a positive correlation of SOC with age (Antonovsky & Sagy, 1986; Ryland & Greenfeld, 1991). Analysis from the NPHS indicated a positive (.22) correlation (Hood et al., 1996).

Research has described the characteristics of childhood life experiences that promote a strong SOC. Sagy and Antonovsky (1996) conducted partially structured life-story in-depth interviews with two retired Israeli women to evaluate the extent to which their childhoods were characterized by order and clear messages, appropriate demands, and a sense of belonging. This qualitative research found that these experiences differed in individuals with contrasting SOC, and the authors concluded that childhood life experiences shape coping ability and SOC. Although this case study was limited by the sample size, the study's conclusion has also been supported by evidence from the Canadian NPHS of a negative correlation between SOC and traumatic events in childhood (Hood et al., 1996). The identification of community stability as a predictor of SOC in a cross-sectional study of Israeli high school students, some of whom were to be evacuated from the Sinai, also supports the importance of consistency in early life (Antonovsky & Sagy, 1986).

The extent to which early life experiences are consistent and load balanced, and allow for participation in socially valued decision making may vary with SES. Children raised in homes with insufficient resources (for food, shelter, or clothing; or to participate in meaningful leisure/cultural activities); teenagers attending school with little support from home; or young adults facing unemployment may not have the opportunities for experiences that strengthen SOC.

Although SOC is thought to be an individual dispositional orientation that is influenced by family, genetics, chance, and other personality-shaping factors in early life (Antonovsky, 1996a), Antonovsky (1992) also acknowledged the structural sources of SOC in later life. Sense of coherence is thought to be determined by the pattern of life experiences that are molded by "one's position in the social structure and by one's culture" (Antonovsky, 1996a, p. 15). Because SES is a measure of one's position in the social structure, a theoretical premise can be made for an association between SOC and SES.

Income and Education

The role of resources seems critical to the discussion of the link between SOC and SES. In addition to the use of SES as an indicator of one's ranking in society (Williams, 1990), SES is also used as a measure of the access to resources such as knowledge, money, power, prestige, and social connectedness (Link & Phelan, 1995). Social class and societal conditions influence the availability of generalized resistance resources, which in turn affect the formation and maintenance of SOC (Antonovsky, 1987, p. 91). But there is a synergistic relationship between SOC and GRRs. Resources determine and reinforce SOC, and SOC determines the extent to which available resources are utilized (Sullivan, 1993). This reciprocal relationship is important to consider in discussions of SOC and SES.

Although intuitively it would seem that women with inadequate financial or educational resources might be in situations that are not conducive to the creation and/or maintenance of a strong SOC, few researchers have used SES variables to predict SOC. Nyamathi (1993) investigated the relationship of SOC, concerns, appraisal of threat, emotional distress, and high-risk behavior in 581 minority women considered to be at risk for HIV infection. In this study, homelessness, a life situation that may be considered a dimension of SES, was not related to SOC. Education was also not associated with SOC, which led the authors to speculate that SOC may reflect a belief system, cognitive structure, or "orientation to life" that is unaffected by skill acquisition.

A study using the 1994-1995 NPHS data reported the correlation coefficients between SOC and socio-demographic factors (Hood et al., 1996). In this study, the income and education variables were treated as categorical. Those in the lowest income group had a lower SOC than did all other income groups. Education also shows a general trend: the more education, the stronger the SOC. However, this relationship is weaker than for income.

Further analysis of the relationship of SOC with education and income is warranted. A study of American home health care workers reported a significant association between education and SOC (George, 1996), yet the Nyamathi (1993) study of minority women did not. The relationship of education and SOC in the NPHS study, which included both males and females, was weak (Hood et al., 1996). The role of income in the relationship with SOC is relatively unexplored, yet the bivariate correlation in the NPHS study prompts further consideration.

Occupation

Antonovsky (1987) hypothesized that one's work is a life experience that can provide consistency, load balance, and participation in decision making, and hence may influence SOC. Joy and pride in one's work as well as the cultural value of the work may enhance meaningfulness, as may the opportunity for choice in tasks, sequence, and pace of work, often referred to as *decision latitude* (Antonovsky, 1987). Because the perception of manageability is influenced by experiences of appropriate load balance, the availability of resources at work is significant to prevent situations of overload. Antonovsky (1987) also warned, however, of the dangers of underload that can occur with work positions that disregard individual potential. Perhaps this has implications in situations where low-wage jobs require few skills and are not socially valued, situations that are particularly relevant for women who are clustered in jobs as clerical, factory, and service workers (Cohen, 1994; Kaufert, 1996). Finally, a sense of comprehensibility is thought to be created by consistent work experiences, shared values and expectations, and job security (Antonovsky, 1987, p. 115).

A few studies have explored SOC in occupational settings. Sense of coherence has been studied as part of work stress research with occupations such as university professors (Ryland & Greenfeld, 1991) and nephrology nurses (Lewis, Bonner, Campbell, Cooper, & Willard, 1994). Only one study was found that compared SOC in different occupations in the same work environment. George (1996) reported that when home health field workers were divided into occupational groups, home health care aides had the lowest SOC, followed by registered nurses and social workers. The authors concluded that factors contributing to the low SOC of home health aides were their perceived inability to refuse assignments that had a potential for risk and their position at the "lowest end of the totem pole" in home health care. This study, however, did not disentangle the effects of income or education from occupation.

Although Antonovsky (1987) described the different work environments that hypothetically could influence the formation and maintenance of SOC, research has not yet confirmed the relationship. Research concerning the variations of SOC among different occupations and work situations has been limited.

Summary

In summary, the relationship between SES, SOC, and health has not been adequately explored. Many researchers have described the relationship between SES and health, yet empirical evidence for an association between SES and SOC has been limited. Although some studies have used the SES indicators as control variables (Anson, Rosenzweig, & Shwarzmann, 1993; Midanik, Soghikian, Ransom, & Polen, 1992), there has been a paucity of studies that have specifically examined the influence of SES on SOC. Identification of the structural sources of SOC might be obtained by using SOC as a dependent variable, yet few studies have been conducted this way. Although the literature has focused on other psychosocial factors that mediate the effect of SES on health (Adler, 1994; Williams, 1990), SOC has not been identified as an intervening variable in the SES and health relationship.

The mechanism for the influence of SOC on health has been examined, but with inconsistent results. Sense of coherence has not been found to buffer the effects of stress on depression or psychological distress (Flannery & Flannery, 1990), nor the effects of recent life events on health (Carmel, Anson, Levenson, Bonneh, & Maoz, 1991). Using the NPHS data, Hood et al. (1996) found that the interaction variable of recent life events and SOC was significant only in the regression using the health utility index as a dependent variable, yet the interaction variable (traumatic events x SOC) was significant for all of the health measures. The role of SOC as a buffer to the socioeconomic effects on health has not yet been empirically studied.

There is a gap in the literature on the impact of the social and economic environment on the health of Canadian women. Few studies utilized the SES indicators of income and education as explanatory variables of women's health, and even fewer discussed the effect of occupation. Although much of Antonovsky's (1987) original work was conducted by examining the experiences of women, and he related SOC to the roles and occupations of women, few studies explaining the role of SOC have been specific to women or have described the relationship between occupation and SOC.

CHAPTER 3

METHODOLOGY

A correlational study was employed to describe the relationship among the variables of SES, SOC, and health in Canadian women between the ages of 20 and 64. This chapter will describe the data source and sample, the variables used in this study, and the methods of data analysis.

The Sample

The 1994-1995 National Population Health Survey was used as the source of the data. The NPHS is a cross-sectional survey of Canadian health status, health services, risk factors, and demographic and socioeconomic characteristics (Tambay & Catlin, 1995). Basic information such as socioeconomic characteristics, health care utilization, restriction of activities, and chronic conditions are gathered on all members of the selected household through face-to-face computer-assisted interviews. Health information pertaining to the individual's self-perception of health and health behaviors, however, was collected for only the randomly selected household individual who became known as the panel respondent. These panel respondents will be interviewed at 2-year intervals for up to 20 years, providing the NPHS with a longitudinal component. In this study, only the cross-sectional data from the 1994-1995 interviews with panel respondents were utilized.

The Sample Frame

The NPHS target population includes individuals from all of the provinces and territories. An attempt was also made to sample those individuals in long term care or residential care facilities. Not included are those living on Indian Reserves, in some remote areas, and on Canadian Forces Bases (Tambay & Catlin, 1995).

The Sample Design

The NPHS utilized a multistage stratified sampling method, similar to that used by the Labor Force Survey. Clusters were defined by geography and/or socioeconomic characteristics and then sampled using a randomized probability-proportional-to-size (PPS) sampling scheme, where size is the number of households. Dwelling lists of the sampled clusters were obtained, and households were then selected using the predetermined sample rates. When this resulted in an excessive sample yield, subsampling occurred, and the design weights were altered. Four data-collection periods were utilized: June, August, and November 1994, as well as March 1995. A cluster was visited during only one collection period (Tambay & Catlin, 1995).

This sample design varied somewhat with the regions. The NPHS Quebec sample was selected from the dwellings participating in a 1992-93 health survey, which also utilized clusters stratified by socioeconomic characteristics, and selected using PPS sampling (Tambay & Catlin, 1995). The Northwest Territories sample was obtained by randomly selecting households from each community with a population greater than 100. In the Yukon, random digit dialing was used in four communities, and a PPS sample was selected elsewhere.

The provincial sample size was determined by population sizes according to the 1991 household Census. The disadvantage of this method is that the sample size for certain regions may be inadequate for provincial use. As a result, some provinces chose to buy-in or to augment their sample in order to satisfy their own requirements.

Consideration was given to the technique of selecting the panel respondent. The probability of the selection of one member of the household is the inverse of the number of people in the household, possibly resulting in a panel that overrepresents individuals from small households, such as the single and the elderly, and underrepresents those from large households, such as parents and dependent children. A "rejective" technique was applied to the selection of household panel respondents to compensate for this tendency. A portion of the identified sample households was rejected if the household did not have at least one member under age 25 (Tambay & Catlin, 1995).

The 1994-95 NPHS sample size of 26,430 households included the provincial buy-ins and those households eligible for rejection. Nonresponse biases the sample, because the sample will differ from the population from which it was drawn. Procedures to reduce nonresponse were implemented. If the household did not agree upon first contact to participate in the NPHS, the interviewers were instructed to send a letter followed by another visit. Refusals were followed up by senior interviewers or supervisors. Numerous call-backs were made to those households where no one was at home, and appointments were made for future contact if the interviewer's visit was inconvenient. These strategies resulted in an 88.7% household response rate (Health Statistics Division, 1995b).

Protection of Human Rights

The National Population Health Survey public use file was utilized as the source of data for this study. In an effort to protect human rights, Statistics Canada releases to the public use file only information that will not reveal the identity of the respondents. Three techniques are employed to ensure anonymity in the public use microdata file. Only large geographic units are reported, detailed response categories are replaced with more general categories, and some variables are suppressed (Health Statistics Division, 1995b).

Variables

A restricted number of variables were chosen as indicators of the three main constructs of SES, SOC, and health. The variables of household income adequacy, educational attainment, and occupation were selected as the SES indicators. Self-rated health was selected as the measure to tap the health construct, and the SOC-13 was used to measure the sense of coherence construct. Other variables from the data set were age, marital status, and the statistical weight variable for the female panel respondents. Only data from the women aged 20 to 64 were used. Because age and marital status may be related to the SES indicators, SOC, and self-rated health, age and marital status were used as control variables.

Sense of Coherence

The construct sense of coherence (SOC) was conceptualized in this NPHS survey as a healthy outlook on life (Hood et al., 1996), or the extent to which individuals perceive events as comprehensible, manageable, and meaningful (Health Statistics Division, 1995b). The 13-item questionnaire that operationalized the SOC concept includes four items addressing the concept of manageability, four items addressing meaningfulness, and five items addressing comprehensibility. The interviewer read to the panel respondents 13 questions and asked them to respond with a number between 0 and 6. The adjectives describing the anchors of 0 to 6 were provided by the interviewer for each question, the responses were summed, and a total SOC score was calculated (measured by the variable DVSC194). The higher the total SOC score, the greater the sense of coherence (Hood et al., 1996).

The SOC construct was first operationalized by Antonovsky (1987) with a 29-item, 7-point semantic differential scale called the Orientation to Life Questionnaire. Based on Guttman's work, Antonovsky developed the scale using a mapping sequence that required a different element of four facets (modality, source, demand, time), as well as one of the three SOC components in each item. This formula resulted in each item having a different facet structure. He later published a shortened version of this questionnaire (SOC-13), and it was these 13 questions that were utilized in the NPHS (Antonovsky, 1993; Hood et al., 1996) (see Appendix A).

There is one difference in the scale used by NPHS and that of the published SOC-13, however, making comparison between studies difficult. In the NPHS, each item is scored from 0 to 6; the SOC-13 scored each item from 1 to 7. The NPHS coding produced a total SOC score that ranged from the lowest possible score of 0 to the highest possible score of 78.

Previous research has established the reliability of both the original 29-item questionnaire and the shortened version of 13 items (Antonovsky, 1993). Reliability is a measure of the extent to which the instrument's scores are consistent and repeatable, and the reliability coefficient reflects the variance in the test that is attributed to a true or nonrandom variation (Mishel, 1989). Internal consistency of the SOC and the test-retest reliability have been reported.

The Cronbach alpha measure of internal consistency is a measure of the homogeneity of the various items in an instrument, and a coefficient alpha of greater than .80 is considered to be an adequate level for research (Nunnally, 1978). The Cronbach coefficient alpha for SOC-13 has ranged from .74 to .91, with a mean of .82 (Antonovsky, 1993). The NPHS SOC Cronbach alpha was reported to be .83 (Hood et al., 1996) and thus may be considered to have attained an acceptable level of internal consistency.

The measure of stability, or the test-retest reliability, is an appropriate test for a concept or trait thought to be stable over the testing time period. The higher the coefficient, the more stable the measurement instrument is thought to be. It is generally used to measure the stability of the instrument and not of the concept being tested (Mishel, 1989). Although research has not yet established the stability of the SOC construct (Greyer, 1996), Antonovsky (1993) considered SOC to be stable after young adulthood, and as such has calculated and reported the test-retest reliability. The SOC-29 test-retest correlations in a group of 33 Israeli medical students was .41 after two years and .91 in a two-week test-retest situation for 307 US college students (Antonovsky, 1993). The SOC-13 test- retest reliability coefficient has been calculated in a study of US veterans to be .77 after 6 months (Coe et al., 1990). The variation of results over time may be related to the difference in the interval of time between testing, or it may be a reflection of a true change in the construct and not indicative of the reliability of the instrument.

The validity of the SOC-13 is the extent to which the SOC-13 measures what it is supposed to measure. Colleagues assisted Antonovsky (1993) in the operationalization of

SOC and reviewed the questionnaire items for content and face validity. Since publication of the SOC instrument, empirical evidence supporting construct validity of SOC has been reported in the literature. A valid instrument must also be able to discriminate between other constructs, an issue that remains controversial in the operationalization of SOC.

Convergent validity is a component of construct validity that attempts to confirm validity by using different methods to measure the same concept. Attempts to produce a scale to measure SOC, prior to the publication of Antonovsky's (1993) scale, enabled researchers to correlate the different scales to establish convergent validity. Antonovsky reported that the unpublished correlations ranged from .39 to .72.

The means of the SOC-13 questionnaire have also been shown to differ with groups in the predicted direction, and Antonovsky (1993) believed that this evidence supports the validity of the scale. Nyamathi's (1991) study of homeless women reported a mean of 55 that contrasts with the mean of 66 for American female university faculty members (Ryland & Greenfeld, 1991) and the mean of 73.8 for American home care social workers (George, 1996).

The extent to which SOC is correlated with constructs to which it is theoretically linked provides support for construct validity via external association (Mishel, 1989). After the development and publication of the Orientation to Life Questionnaire used to measure the SOC construct (Antonovsky, 1987), investigation focused on the relationship of SOC with various measures of stress, coping, and health outcomes, as well as with other constructs that share similar elements with SOC. SOC is positively correlated with constructs such as internal locus of control, self-esteem, hardiness, coping resources, and trait anxiety, and is negatively correlated with work load, perceived stressors, and distress (Antonovsky, 1993; Carmel et al., 1991; Dahlin et al., 1990; Flannery & Flannery, 1990; Lewis et al., 1994; Nyamathi, 1991).

Although this correlation with theoretically linked constructs supports the validity of the SOC scale, questions are raised if the correlations are too high. Strong correlations between SOC and depression (r = .75) and mental health (r = .80) have been found (Dangoor & Florian, 1994; Flannery, Perry, Penk, & Flannery, 1994), and consequently have raised concerns about the possible overlap of content items in the SOC scale and the mental health questionnaire (Dangoor & Florian, 1994), and in the SOC scale and the BDI depression (Flannery & Flannery, 1990). The ability of the SOC instrument to measure SOC as a distinct construct, and not as an inverse measure of depression, is a concern yet to be addressed (Geyer, 1997). This is not considered an issue for this proposed study because mental health measures are not directly utilized.

Self-Rated Health

The NPHS survey utilized the question, "In general would you say that your health is excellent, very good, good, fair or poor?" to measure the individual's perception of his or her own well-being (Health Statistics Division, 1995b). This question has been used as a measure of health in many surveys, and the literature has reported support for the validity of this question as a measure of health. It is thought to tap the individual's evaluation of his or her own health, as well as his or her interpretation of the overall construct of health (Bergner & Rothman, 1987; Fylkesnes & Forde, 1992). Because of the subjectiveness of this measure, a change in physical or psychological functioning may not necessarily affect interpretation of health. Nevertheless, self-rated or self-perceived health has been shown to correlate with other measures of health.

Self-rated health has been correlated with specific health problems, the use of health care services, and mortality (Adams, 1993). Self-rated health has been reported to predict 3- and 6-year mortality in the elderly (Mossey & Shapiro, 1982), and in a 9-year follow-up study, the relative risk of cardiac and total mortality for those who reported poor health was 2.52 compared to those who rated their health as good (Kaplan & Camacho, 1983).

The reliability of self-rated health has not been established because a single-item question cannot be tested for internal consistency, and test-retest results are not applicable for this highly subjective measure, which is subject to fluctuations (Bergner & Rothman, 1987). Although reliability cannot be measured, the correlations with other measures of health provide support for the construct validity of self-perceived health.

Educational Attainment

In this study educational attainment was measured with a derived variable (DVEDC294) based on the individual's response to questions concerning attendance and completion of educational programs (see Appendix B). The categories were coded from 1 to 12, with 12 representing the highest level of education.

Household Income Adequacy

Income adequacy (DVINC594) is derived from the number of people living in the household and the total household income from all sources in the past 12 months. Individuals are classified into one of five household income groups: lowest income, lower middle, middle income, upper middle, and highest income (see Appendix C). This derived variable is more likely than total household income to reflect purchasing power or the woman's financial ability to provide for the household's basic needs.

Occupation

The Pineo socioeconomic classification is used to derive the occupation variable (DVPIN94) based on the individual's main job in the previous 12 months. Although the information on occupation is captured in a four-digit occupation code, only 16 categories are released to the NPHS public use microdata file (see Appendix D).

Age

The NPHS public use microdata file releases age in five-year cohorts (see Appendix E). The age variable (AGEGRP) was used to select only the individuals who were between 20 years and 64 years.

Marital Status

Current marital status (MARSTATG) was grouped into three categories: married/common-law/partner, single, and widowed/divorced/separated.

Validity of the Survey Instrument

The Computer Assisted Interview process (CAI) was utilized by the NPHS. The reliability of a survey instrument is enhanced by the interviewer asking the same questions to all respondents using the same words (Fowler, 1993). Closed questions, as used in this study, with the provision of a list of acceptable answers is another way to ensure reliability because the respondents have the same perception of what constitutes an adequate answer.

The survey instrument was tested though focus groups and field tests prior to implementation. Efforts were made to reduce the nonsampling errors in the survey by implementing quality assurance measures in the data collection (Health Statistics Division, 1995b).

Data Analysis

The NPHS data set for this secondary data analysis was obtained from the University of Alberta Data Library. Variables which were requested included SOC, self-rated health, income, education, occupation, age, marital status, and the statistical weight variables for the female panel respondents of the 1994-1995 National Population Health Survey. Only data from women aged 20-64 were used in this study. Analysis was conducted using the Statistical Package for Social Sciences (SPSS) Version 8.0 for Windows, using a .05 significance level.

The NPHS Public Use Microdata Documentation guidelines that relate to rounding of estimates and the publication recommendations were followed (Health Statistics Division, 1995b). Estimates and sums in the main body of a statistical table were rounded to the nearest hundred units, whereas averages, proportions, rates, and percentages were computed from unrounded components and then rounded to one decimal.

Statistical Considerations

The type of measurement scale dictates the statistical analysis that is appropriate. Although traditionally parametric tests have been used only for interval or ratio scales, the use of these tests on ordinal data has not made a significant difference to the data analysis results (Brink & Wood, 1994). For this study, ordinal variables such as the SES and the self-rated health variables were considered to be interval data.

The parameters of the population, or the characteristics of the population from which the sample was drawn, are of interest to this study. Although these parameters are unknown, we can make inferences based on the sample data statistics (Agresti & Finlay, 1986). The probability sample design, as described above, enables the employment of a variety of statistical tools that can estimate the precision of the sample estimates (Fowler, 1993).

Weighting

Statistics Canada provides a weight variable (Wt6) in their data sets to permit findings to be generalized to the Canadian population. In a survey in which the results of the sample are to be generalized to the population, it is assumed that each person in the sample represents him- or herself, as well as several other people not in the sample. The weight is allocated to indicate the number of people that each person represents. Whereas in a simple probability sample the weight is the same for all individuals, in this complex multistage stratified national survey the weight differs for each individual (Health Statistics Division, 1995b). The weight (Wt6) variable was used as recommended by Statistics Canada to derive estimates of the population. This weighting procedure, while producing correct estimates, also calculates variances that are almost meaningless. It also overestimates the number of cases in each cell derived from cross-tabulation procedures. Therefore, in the bivariate and regression analyses the weights on the records were rescaled so that the average weight (wt) was one (Health Statistics Division, 1995b).

Sample Size

There are several issues to consider when determining the adequacy of the size of the sample. There are two methods used to determine sample size: ratio of predictors to cases and power analysis (Polit, 1996).

A quick method of estimating the sample size requirement is to calculate the number of cases based on a ratio of predictors to cases. Tabachnick and Fidell (1989) recommended that for standard multiple or hierarchical regression, at least 20 cases should be used for each predictor variable. In this study with a maximum of six predictor variables, at least 120 cases were needed, yet the requirement was said to increase if the dependent variable was skewed, the effect size was small, or if measurement error was expected from unreliable variables.

Another more specific method of determining the sample size is to conduct a power analysis. The power of a study is equal to 1 - β, and a power analysis determines the sample size requirements needed to reduce the risk of a Type II error. A Type II error occurs when the researcher concludes that there is no relationship when in reality there is (Polit, 1996). To calculate the sample size needed for use in this multiple regression, the estimated effect size (small or .02), the number of predictors (6), the desired power (.80), and the significance criteria ($\alpha = .05$) were used in the following formula:

$$N = \left[\frac{\lambda}{\gamma}\right] + \kappa + 1$$

where N = estimated number of cases needed; λ = tabled value for the specified alpha, power and 6 predictors (13.62); γ = estimated effect size; and k = number of predictor variables. Using this formula, the calculated sample size needed with an estimated small effect size is 681 cases.

It is apparent that the sample from the NPHS will fulfill the sample size requirements based on either method. There continues to exist, however, a controversy about the use of power analysis in determining the sample size of a survey (Fowler, 1993).

Fowler (1993) commented that it is difficult to estimate the desired level of precision or the specific acceptable margin for error in advance. This artificial precision tends to imply that the only source of error is the sampling error, when in reality there will be error from sources other than sampling.

Data Exploration

Frequency tables and histograms were examined as the first step in data screening to ensure the inclusion of relevant variables, the assignment of missing values, the identification of out-of-range values, and an adequate number of valid cases. Measures of central tendency, variability, and normality of the variables were also calculated and used in the creation of new variables.

Creation of New Variables

This study's premise that the higher the SES and SOC, the greater the self-rated health was reflected in the original scoring of all variables except for occupation and self-rated health. These two variables were reverse scored to better reflect this study's conceptual definitions. The occupation variable was reverse scored to change the representation of the highest value from farm laborer to self-employed professional. Self-rated health was reverse scored to change excellent health to represent a high value (excellent = 5) from its previous value of 1.

To facilitate cross-tabulation and subgroup analysis, a new SOC3 variable was created after reviewing the values, distribution, and frequencies of the SOC variable. SOC3 was created by considering those within one standard deviation of either side of the mean as being 'med SOC' and considering those cases outside of this range as either 'high SOC' or 'low SOC.' Because the SOC mean for this study was 57.7 and the standard deviation was 12.5, the values used to create the SOC3 categories were 0-44 (low SOC), 45-70 (medium SOC), and 71-78 (high SOC). About two thirds of those surveyed were 'medium SOC,' one sixth were 'high SOC,' and one sixth were 'low SOC.' This new variable was labeled as SOC3 and used in the cross-tabulation and subgroup analysis.

The 12-category derived education variable was used in three forms: original 12 categories, collapsed to 11 categories, and collapsed to 5 categories. The 12-category ordinal variable was used in the descriptive analysis and multiple regression, but the 'no schooling' and 'elementary' categories were collapsed to 'elementary or less' for use in the analysis of variance. This variable was further collapsed to 5 categories to increase the cell frequency and to enhance ease of interpretation in cross-tabulation. The five categories were: *no schooling/less than elementary/some secondary* =1; *secondary school graduation* = 2; *other beyond high school/some trade school/some community college/some university* = 3; *trade school/community college certificate/diploma* = 4; and *bachelor/master/medicine/PhD* = 5.

To describe the relationship between health and specific occupational groups through cross-tabulation, the occupation variable was collapsed into five categories labeled as *unskilled, semiskilled, skilled, managerial/technical,* and *professional*. Farm laborers, unskilled manual, and unskilled clerical/sales were labeled as *unskilled* (1), semiskilled manual and semiskilled clerical/sales were labeled as *semiskilled* (2). The farmers, skilled crafts/trades, and the skilled clerical/sales/service were coded as *skilled* (3), and the forewomen, supervisors, middle management, and technicians were coded as *managerial/technical* (4). Finally, the semiprofessional, high-level management, employed professionals, and self-employed professionals were categorized as *professionals* (5). This facilitated comparison with other studies examining health and occupation (Cairney & Arnold, 1996).

The three categories of marital status (married/common-law/partner, single, and widowed/divorced/separated) were collapsed to create a dichotomous variable. Attached (married/common-law/partner) was equal to 1, and unattached (single/ widowed/divorced/ separated) was equal to 0.

Multiplicative interaction terms were created by taking the product of the SES variable and the SOC variable. Three terms were created: Income x SOC, Education x

SOC, and Occupation x SOC. Multicollinearity and the resulting inflated standard errors are recognized concerns with the use of interaction terms. To reduce this risk, the SES and SOC variables were 'centered' by using the deviation from the mean scores, prior to forming the multiplicative terms (Jacard, Turrisi, & Wan, 1990). For example, Centered SOC was computed by taking the actual value of SOC and subtracting the SOC mean of 57.7. The variance of these new variables was unchanged from their original form, and these new centered terms had low correlations with their component parts.

Missing Data

Missing data in survey research results from some subjects refusing or failing to respond to certain items while responding to others (Cohen & Cohen, 1983). The frequency tables for this cohort indicated that the survey collected complete information for the age, marital status, and self-rated health variables. A proportion of respondents did not provide responses for the variables of derived income adequacy (4.1%), derived education, (.1%), occupation (31.2%), and SOC (4.2%).

Missing data can be treated by either deleting the cases with missing values (listwise deletion), deleting the variables, or substituting the missing value with a group mean (Tabachnick & Fidell, 1989). Because there is a minimal number of variables being used in this study, it was problematic to delete the occupation variable with a large number of missing responses. The large percentage of missing data for the occupation variable (31.2%) can be attributed to the "not applicable" response (28.5%) that was generated if the respondents had not been employed in the last year. Because this study is interested in the effect of occupation on health and SOC, occupation was included in this analysis despite the missing data, resulting in a smaller sample size in the data analysis that utilized the occupation variable. When occupation was not used as an SES indicator, however, the complete data set was utilized, allowing for representation from those women not employed in the previous year.

Missing data are a concern if they are not randomly distributed throughout the sample. When the presence/absence of data is related to either the dependent variable or another predictor variable (Cohen & Cohen, 1983), the deletion of these respondents with missing data (listwise deletion) might bias the sample. Tabachnick and Fidell (1989) recommended that the data be tested to determine whether or not the missing responses are randomly distributed; thus, a dichotomous variable (1 = absent data, 0 = present) was created for the income and SOC variables. The present/absent SOC variable and the present/absent income variable were then used in regressions. These variables were found to be statistically insignificant in the regressions with self-rated health as the dependent variable. When SOC was regressed on the present/absent income variable, however, the variable was statistically significant ($p = .007$). The results of the missing data analysis suggest that the missing income data may be related to the SOC variable.

The regression analysis was then conducted with the incomplete income data cases by adding the group mean. The regression using the complete and incomplete data cases was compared, and the difference was found to be inconsequential, probably related to the small percentage of missing data. Because the substitution of the missing value with the group mean did not make a significant difference to the regression, only the results of the regression using listwise deletion is presented.

In summary, the variables with the highest percentage of missing data were occupation (31.2%), SOC (4.2%), and income (4.1 %). These variables were not deleted from the study. Pairwise deletion was used in the bivariate analysis, and listwise deletion was used for the multivariate analysis.

Methods of Analysis

Three different methods of analysis were used in this study: descriptive statistics, bivariate statistics, and multivariate statistics. The data were first explored with descriptive statistics. The relationship between the SES, SOC, and self-rated health variables was then examined with bivariate and multivariate analysis. Multivariate analysis was used to address the two research questions.

Descriptive Statistics

Descriptive statistics were computed for the age, marital status, income adequacy, educational attainment, occupation, SOC, and self-rated health variables. Information about the characteristics of the sample was gleaned from an examination of the frequencies and frequency histograms. As the underlying assumption for many of the statistical procedures concerns the variable's distribution, the measures of central tendency, measures of dispersion, and results from the tests of normality were also reviewed. These calculations were made with the sampling weight (Wt6) provided by the NPHS.

Bivariate Statistics

An initial indication of the relationship between variables was garnered from cross-tabulations or cross-classification tables (Agresti & Finlay, 1986). Cross-tabulation was used to describe the relationship between the independent SES variables and the dependent self-rated health variable. To make the interpretation more manageable, the collapsed education and occupation variables were used. Finally, the new SOC3 variable was cross-tabulated with the dependent self-rated health variable.

In this method of data analysis, information about the relationships is garnered through the cell entries and the measures of association. The independent variables were used as the row variables and row percentages were requested. The results were interpreted by comparing the row percentages down the columns. The nature of the association between the variables was calculated with the Kendall's tau-b. The Kendall's tau-b measure of association describes the extent to which the ranking of the respondent on one variable is statistically associated with the ranking on another variable and takes ties into account (Agresti & Finlay, 1986).

A significant difference among the SOC means of the various SES categories provides evidence of a relationship between SOC and SES. The group mean of the interval SOC variable was calculated within the categories of the income, education, and occupation variables. The interval nature of the SOC variables allows for a comparison of group means by using the analysis of variance (ANOVA) procedure (Agresti & Finlay, 1986; Munroe & Page, 1993). The Tamhane method of post hoc multiple comparison was conducted to identify which means were different and the extent to which they were different. The Tamhane method was selected because the Levene's Test for Equality of Variance was significant for all the SES variables, indicating a difference in variability in SOC between the various SES groups. This t-test adjusts for unequal variance (Norusis, 1993, #83).

Linear association was then calculated among the marital status, age, income, education, occupation, SOC, and self-rated health variables. The linear relationship among the variables was quantified with the Pearson product moment correlation coefficient (r).

Multivariate Analysis

Although the bivariate analysis provides an initial picture of the relationship between the variables, multivariate analysis was necessary to address the research questions. The regression analysis was first explored, however, to determine if the data met the assumptions of statistical tests. The two research questions were then investigated utilizing multiple linear regression to conduct path analysis and to explore interactions.

Research Question #1: Is SOC an Intervening Variable in the SES and Health Relationship?

An intervening variable is a term used in path analysis that describes a variable that is both a dependent variable and a predictor variable for another dependent variable. This study used path analysis, the statistical procedure that utilizes linear regression models to test theories of causal relationships (Agresti & Finlay, 1986; Musil, Jones, & Warner, 1998) among the variables. A path model, conceptually displayed in Figure 1, was created based on a hypothesis of causal order.

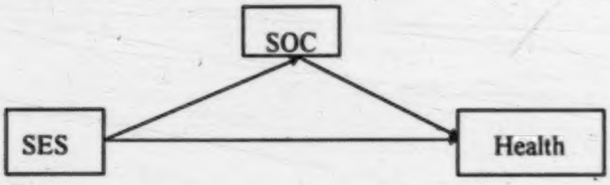


Figure 1. Conceptual model of SOC as an intervening variable.

In this model, two dependent variables, SOC and self-rated health, were used. It was postulated that the SES indicator variables (income, education, and occupation) contribute to both SOC and health. The model tested for a direct SES effect on health as well as an indirect effect through SOC. SES was proposed to influence SOC, which in turn affects health. This causal hypothesis describes the indirect effect of SES on health through SOC.

In this study five path models were analyzed and compared. The first three models compared the effects of the different SES indicators of income, education, and occupation on SOC and self-rated health. One of the assumptions, however, of multiple regression using ordinary least squares (OLS) estimation is that the variables not specified in the model and subsumed under the error term are not correlated with variables within the model. Because the three SES variables are correlated, an omission of the other SES variables from the model could bias or inflate the regression coefficients (Musil, Jones, & Warner, 1998; Pedhazur, 1982). In consideration of this potential model specification error, all of the SES variables were then added to the fourth path model. Because the inclusion of the occupation variable eliminated a substantial proportion of the sample, specifically the nonworking women, only the education and income SES variables were used in the fifth path model.

The direct, indirect, and total effects were calculated from the path coefficients. The direct effects were obtained from the multiple regressions, and the indirect effects were computed by the product of the coefficients in the chain of effects that leads from SES to health through SOC. The total effects were calculated as the sum of the direct effect plus the indirect effect. The unanalyzed components in these path models were the correlated exogenous variables (Polit, 1996). This included the SES indicators as well as the marital status and age variables. Marital status and age were used as control variables because they were thought to be related to the other variables.

Path coefficients represent the impact one variable has on another in the causal model and can be represented by standardized coefficients (βs) or unstandardized coefficients (bs). Both standardized and unstandardized path coefficients have been used in the past with advocates for both methods. The advantage of standardized path coefficients is that they are scale free and can be compared across different variables (Pedhazur, 1982). The major shortcoming of standardized coefficients, however, is that they are population specific. Information about the variance of the variables is inherent within the standardized or β coefficient, prompting Duncan (1975) and others (Kim & Mueller, 1976) to urge the use of bs or unstandardized coefficients, particularly when the objective is to establish causal models that are invariant across populations. Sewal Wright (as cited in Pedhazur, 1982), who developed the path analysis method, concluded that each method provides a different perspective of the quantitative information that can be gleaned from path analysis. It is hoped that the blend of the methods will enhance the interpretation of the data. In this study, both unstandardized and standardized coefficients were reported.

Research Question #2: Does the Relationship Between Socioeconomic Status and Health Vary as a Function of Sense of Coherence?

The second research question sought to find evidence for an interaction between each of the three SES indicators and SOC. Statistical interaction is said to occur when the relationship between two variables changes as the level of a third variable changes (Agresti & Finlay, 1986). SES and SOC may interact in their effect on the dependent variable of health. SOC could then be described as a moderator variable because the nature of the relationship between SES and health varies depending on the SOC level (Jaccard, Turrisi, & Wan, 1990). This moderated causal relationship is modeled with a conceptual diagram in Figure 2.

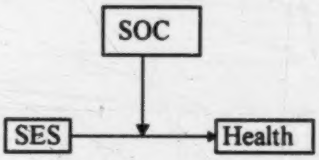


Figure 2. Conceptual model of SOC as a moderating variable.

Two methods were used to address the research question: a multiplicative interaction term in multiple regression and subgroup analysis.

Multiple Regression With Multiplicative Interaction Terms

A cross-product term or a multiplicative interaction term can be added to a multiple regression equation to model interaction (Agresti & Finlay, 1986).

$$H = a + b_1 SES + b_2 SOC + b_3 SES \times SOC + b_4 Age + b_5 MS + e \qquad (1)$$

where H = health and MS = marital status.

To identify the effect that SES has on health, equation 1 can be rearranged as suggested by Hayduk and Wonnacott (1980) and re-expressed as in equations 2 and 3.

$$H = a + (b_1 + b_3\,SOC)\,SES + b_2\,SOC + b_4\,Age + b_5\,MS + e \tag{2}$$

$$\text{or } H = a + (b_2 + b_3SES)SOC + b_1SES + b_4\,Age + b_5\,MS + e \tag{3}$$

It becomes clearer with equation 2 that the impact of SES on health depends on the level of SOC.

Three regression equations were run, one for each of the SES variables (income, occupation, education), controlling for age and marital status. Self-rated health was regressed on the SES indicator, age, marital status, and SOC. To test for an interaction effect, the multiplicative interaction term was then added to each of the regressions. The significance of the interaction term and of the R^2 change ~~was~~ noted. The regression equations used to test for an interaction effect were:

$$H = a + b_1INC + b_2SOC + b_3SOC \times INC + b_4AGE + b_5MS + e \tag{4}$$

$$H = a + b_1ED + b_2SOC + b_3SOC \times ED + b_4AGE + b_5MS + e \tag{5}$$

$$H = a + b_1OCC + b_2SOC + b_3SOC \times OCC + b_4AGE + b_5MS + e \tag{6}$$

Subgroup Analysis

Self-rated health was regressed on each of the socioeconomic indicators for each of the three subgroups of SOC (low, medium, and high). The bs or the unstandardized coefficients of the SES variables were compared across the SOC groups to determine whether the relationship between SES and health varied with the level of SOC. The significance of the variation in the bs was calculated with the following equation (Jacard et al., 1990):

$$t = \frac{b_1 - b_2}{[SE_{b1}^2 + SE_{b2}^2]^{1/2}} \tag{7}$$

CHAPTER 4

FINDINGS

This chapter reports the findings of the relationship between socioeconomic status, sense of coherence, and self-rated health in Canadian women between the ages of 20 and 64. It begins with a description of the sample in terms of age, marital status, income, education, occupation, SOC (sense of coherence), and self-rated health. Following these descriptive statistics, the analysis of the various bivariate relationships is presented. Finally, the two research questions are addressed using multivariate analysis.

Description of the Sample

The sample for this study included 6,747 females aged 20 to 64. The reported frequency statistics will differ from this number because the weight (Wt6) variable was used to derive estimates of the population, as recommended by Statistics Canada.

Demographic Variables

The frequencies of the age and marital status variables are presented in Table 1. Almost one third (30.1%) of the women were between 30 and 39 years of age. As expected, there were fewer women in the older cohorts. Only 15.1% of the sample were reported to be between 55 and 64. Most of the women (69%) were married or had a common-law relationship. More women were single (17.9%) compared to divorced, separated, or widowed (13%). There were no missing responses for these variables.

Socioeconomic Status

Three SES indicators are used in this study: household income adequacy, highest level of education attained, and occupation.

Table 1

Age and Marital Status

	Frequency (in thousands)	Percentage	Cumulative %
Age			
20 to 24 years	902.1	10.4%	10.4%
25 to 29 years	1,058.4	12.2%	22.5%
30 to 34 years	1,259.3	15.5%	38.1%
35 to 39 years	1.272.5	14.6%	52.7%
40 to 44 years	1,117.7	12.8%	65.6%
45 to 49 years	945.0	10.9%	76.4%
50 to 59 years	742.0	8.5%	85.0%
55 to 59 years	684.6	7.9%	92.8%
60 to 64 years	624.8	7.2%	100.0%
Total	8,706.5		100.0%
Marital status			
Married/common-law	6,009.0	69.0%	69.0%
Single	1,560.7	17.9%	87.0%
Widowed/divorced/sep.	1,133.6	13.0%	100.0%
Total	8,706.5		100.0%

Note. Cases weighted by sampling weight (Wt 6).

The frequency in thousands and the percentage of those in each of the five income adequacy categories are presented in Table 2. The percentage of those in the upper middle income quintile (37.1%) was greater than the other income brackets, while 16.2% were in the highest income bracket and only 6.3% of the survey population were categorized in the lowest income quintile.

Table 2

Derived Household Income Adequacy

	Frequency (in thousands)	%	Valid %
Lowest income quintile	525.6	6.0%	6.3%
Lower middle income quintile	1,019.8	11.7%	12.2%
Middle income quintile	2,351.7	27.0%	28.2%
Upper middle income quintile	3,100.5	35.6%	37.1%
Highest income quintile	1,348.9	15. 5%	16.2%
Total	8,346.4	95.9%	100.0%
Not stated	360.1	4.1%	
Total	8,706.5	100.0%	

Note. Cases weighted by sampling weight (Wt6).

The frequency of the 12 levels of highest education attained is listed in Table 3. Not surprisingly, the percentage of those who reported 'no schooling' was only .1%. Although one fifth (20%) of the surveyed population had not completed high school, about one third (34.8%) had completed a postsecondary program. At the high end of the educational attainment scale, 2.3% had attained a master's, doctorate, or medical degree.

Table 4 presents the frequencies of the 16 occupation categories. The semiskilled clerical/sales/service category had the largest percentage of respondents (20.8%), followed by skilled clerical/sales/service (14.4%), unskilled clerical sales/services (12.4%), and semiprofessionals (11.9%). Very few respondents reported the occupations of forewomen (.3%), farmers (.5%), self-employed professionals (.7%), farm laborers (.8%), and skilled crafts/trades (.9%). Although there were relatively few self-employed professionals (.7%),

Table 3

Highest Level of Education Attained

	Frequency in thousands	%	Cumulative %
No schooling	13.0	.1%	.1%
Elementary school	421.1	4.8%	5.0%
Some secondary school	1,310.6	15%	20.0%
Secondary school graduation	1,566.3	18.0%	38.0%
Other beyond high school	44.3	.5%	38.5%
Some trade school etc.	731.0	8.4%	46.9%
Some community college	1,046.8	12.0%	58.9%
Some university	539.9	6.2%	65.1%
Trade school dip/cert.	821.6	9.4%	74.6%
Community college dip/cert.	903.2	10.4%	85.0%
Bachelor degree (incl. LLB)	1,106.5	12.7%	97.7%
Master/doctorate/medicine deg.	201.3	2.3%	100.0%
Total	8,695.7	99.9%	
Not stated (missing)	10.8	.1%	

Note. Cases weighted by sampling weight (Wt6).

Table 4

Pineo Socioeconomic Classification of Occupation

	Frequency (in thousands)	%	Valid %	Cumulative %
Farm laborer	47.4	.5%	.8%	.8%
Unskilled manual	388.5	4.5%	6.5%	7.3%
Unskilled clerical/sales/service	744.2	8.5%	12.4%	19.7%
Semi-skilled manual	404.	4.6%	6.7%	28.3%
Semi-skilled clerical/sales/service	1244.8	14.3%	20.8%	47.2%
Farmers	32.9	.4%	.5%	47.7%
Skilled crafts/trades	55.6	.6%	.9%	48.7%
Skilled clerical/sales/service	55.6	.6%	.9%	48.7%
Farmers	32.9	.4%	.5%	47.7%
Skilled crafts/trades	55.6	.6%	.9%	48.7%
Skilled clerical/sales/service	862.4	9.9%	14.4%	63.1%
Forewomen	17.9	.2%	.3%	63.4%
Supervisors	149.3	1.7%	2.5%	65.9%
Middle management	501.9	5.8%	8.4%	74.2%
Technicians	86.6	1.0%	1.4%	75.7%
Semiprofessionals	715.7	8.2%	11.9%	87.6%
High-level management	154.6	1.8%	2.6%	90.2%
Employed professionals	543.4	6.2%	9.1%	99.3%
Self-employed professionals	44.479	.5%	.7%	100%
Total	5993.9	68.8%	100%	
Missing: not applicable	2483.2	28.5%		
Missing: not stated	229.6	2.6%		
Total missing	2712.7	31.2%		

Note. Cases weighted by sampling weight (Wt 6).

9.1% were employed professionals. The occupation questions were not applicable for 28.5% of the women.

Sense of Coherence

The SOC values ranged from a low of 4 to a high of 78 (possible range of 0 to 78). The mean, median, and mode of the SOC variable were 57.7, 60, and 64, respectively. Most of the respondents had SOC values at the upper end of the range. The distribution of the SOC values was negatively skewed (-.778), but with a positive kurtosis of .417.

Self-Rated Health

Table 5 shows the distribution of the self-rated health variable. Just under two thirds of the sample (63.6%) described their health as 'very good' (37.1%) or 'excellent' (26.5%), with the most common response being 'very good.' About one quarter (26.7%) rated health as 'good,' and only about 10% of the women rated their health as either 'fair' (7.5%) or 'poor' (2.2%). Similar to the distribution of the SOC variable, the frequency distribution of the self-rated health variable is also slightly negatively skewed (-.56), because most of the respondents reported their health to be in the upper range of the five-category scale. The survey obtained responses to this question from all respondents.

Table 5

Self-Rated Health

Value	Frequency in thousands	%	Cumulative %
Poor	187.2	2.2%	2.2%
Fair	653.7	7.5%	9.7%
Good	2321.4	26.7%	36.3%
Very good	3234.3	37.1%	73.5%
Excellent	2309.8	26.5%	100.0%
Total	8706.5	100.0%	

Note. Cases weighted by sampling weight (Wt 6).

Mean and Standard Deviation of the Variables

The mean and standard deviation of the variables are presented in Table 6. Because these descriptive statistics were derived for the correlation and regression procedures, they were weighted with the rescaled weight (wt).

Table 6

Mean and Standard Deviation of Health, SOC, Income, Education, Occupation, Marital Status, and Age

Variable	M	SD	n
Self-rated health	3.78	.99	6846
SOC	57.70	12.51	6560
Household income adequacy	3.45	1.09	6563
Educational attainment	6.70	3.05	6838
Occupation	7.83	4.35	4713
Marital status (attached = 1)	.69	.46	6843
Age	6.56	2.37	6846

Note. Cases weighted by rescaled weight (wt).

Bivariate Relationships

In this section I present the cross-tabulations of the SES and SOC3 variables with the dependent self-rated health variable, the comparison of the SOC means within the SES categories, and the zero-order correlations. All bivariate relationships were analyzed using pairwise deletion of missing data, and the data were weighted using the rescaled weight variable (wt).

SES and Health

Cross-tabulations were employed to describe the relationship of the three SES variables and health. The Kendall's tau-b was used to measure the association between the row and column variable. The data were weighted using the rescaled weight variable (wt).

The cross-tabulation of self-rated health by income is presented in Table 7. The positive relationship between income and health indicated by the measure of association (Kendall's tau-b = .166, p = .000) is also evident from the cell statistics. In this study the lowest income quintile described health as 'poor' or 'fair' at almost five times the rate of the highest income quintile. At the other end of the health scale, 37.9% of the highest income group described their health as 'excellent,' in contrast to 15.3% of the lowest income group.

Table 7

Cross-Tabulation of Self-Rated Health by Income Adequacy

	Self-rated health					
Income adequacy	Poor	Fair	Good	Very good	Excellent	Total
Lowest income	21	57	132	140	63	413
% within row	5.1%	13.8%	32.0%	33.9%	15.3%	100%
Lower middle	35	99	247	272	148	801
% within row	4.4%	12.4%	30.8%	34.0%	18.5%	100%
Middle	39	166	552	683	410	1850
% within row	2.1%	9.0%	29.8%	36.9%	22.2%	100%
Upper middle	31	141	587	973	706	2438
% within row	1.3%	5.8%	24.1%	39.9%	29.0%	100%

(table continues)

	Self-rated health					
Income adequacy	Poor	Fair	Good	Very good	Excellent	Total
Highest	5	35	224	395	402	1061
% within row	.5%	3.3%	21.1%	37.2%	37.9%	100%
Total	131	498	1742	2463	1729	6563
% within column	2.0%	7.6%	26.5%	37.5%	26.3%	100%

Note. The independent variable is the row variable. Row percentages were requested. The percentages should be compared down the columns. Cases weighted by rescale weight (wt). Kendall's tau-b = .166, p = .000.

The results of this cross-tabulation also provide evidence for an income and health gradient. With each increment in income categories, a smaller proportion of women described their health as 'poor,' 'fair,' or 'good'; and a larger proportion of women described their health as 'excellent.'

Table 8 provides a summary of the cross-tabulation of health by education. To simplify interpretation and increase the cell frequencies, the education variable was collapsed into five categories. The results reveal a significant positive relationship between education and self-rated health (Kendall's tau-b = .166, p = .000), as well as a graded association with health at all levels of education. Whereas 18.9% of women with less than high school education described 'poor' or 'fair' health, only 8.9% of those who had completed high school and 4% of those with a university degree similarly rated their health. There were also fewer women (16.0%) from the lowest education category than from the highest education category (37.2%) who described their health as 'excellent.' A greater proportion of women reported 'excellent' health with each increase on the educational scale.

Table 8

Cross-Tabulation of Self-Rated Health by Highest Level of Education Attained

Highest level of education	Self-rated health					
	Poor	Fair	Good	Very good	Excellent	Total
< High school	57	200	476	413	218	1364
% within row	4.2%	14.7%	34.9%	30.3%	16.0%	100%
High school	23	86	340	481	302	1232
% within row	1.9%	7.0%	18.6%	27.6%	24.5%	100%
Some trade/coll/ univ/other	35	112	481	735	495	1858
% within row	1.9%	6.0%	25.9%	39.6%	26.6%	100%
Trade/comm.college	23	81	307	528	417	1356
% within row	1.7%	6.0%	22.6%	38.9%	30.8%	100%
University degree	9	32	222	383	383	1029
% within row	.9%	3.1%	21.6%	37.2%	37.2%	100%
Total	147	511	1826	2540	1815	6839
% within column	2.1%	7.5%	26.7%	37.1%	26.5%	100%

Note. The independent variable is the row variable. Row percentages were requested. Percentages should be examined down the columns. Kendall's tau-b = .166, p = .000. Cases weighted by rescaled weight (wt).

The results of the cross-tabulation of health by occupation are displayed in Table 9. In this analysis, the five category occupation variable was used to increase the cell frequencies. The Kendall's tau-b (.092) was significant (p = .000). When this statistic is compared with the other health by SES cross-tabulations, the association between occupation and health is statistically weaker than the relationship of income and education with health. This is also apparent by examining the cell frequencies. The difference between those who reported 'poor' or 'fair' health at the bottom of the occupational hierarchy (6.8%) and those at the top (4.1%) was not as substantial as found in the previous cross-tabulations, and the graded association between health and each level of the occupational hierarchy was not as distinct.

Table 9

Cross-Tabulation of Self-Rated Health by Occupation

	Self-rated health					
Occupation	Poor	Fair	Good	Very good	Excellent	Total
Unskilled	10	53	251	381	234	929
% within row	1.1%	5.7%	27.0%	41.0%	25.2%	100%
Semi-skilled	6	68	371	544	307	1296
% within row	.5%	5.2%	28.6%	42.0%	23.7%	100%
Skilled	7	32	196	273	240	748
% within row	.9%	4.3%	26.2%	36.5%	32.1%	100%
Managerial/technical		35	151	214	195	595
% within row		5.9%	25.4%	36.0%	32.8%	100.0%
Professional	13	34	210	460	429	1146
% within row	1.1%	3.0%	18.3%	40.1%	37.4%	100%
Total	36	222	1179	1872	1404	4713
% within column	.8%	4.7%	25.0%	39.7%	29.8%	100%

Note. Independent variable is the row variable. Row percentages were requested. Percentages should be compared down the columns. Kendall's tau-b = .109, p = .000. Cases weighted by rescaled weight (wt).

This cross-tabulation highlights an important difference between the SES indicators. When the occupation variable is used in the data analysis, the sample is reduced by 31.2% because of the high proportion of women (28.5%) for whom the occupational questions were not applicable. Only the employed women were included when occupation was used as an SES variable. This change in sample size also altered the distribution of respondents in the self-rated health categories. For example, 9.7% of the respondents in the full sample described their health as either 'poor' or 'fair,' but the cross-tabulation of health by occupation shows that only 5.5% of this smaller sample similarly rated their health. A smaller proportion of employed women compared to the total sample of employed and unemployed women have 'poor' or 'fair' health.

In summary, the bivariate analysis of the relationship between SES and health revealed that a greater proportion of the women who described their health as 'poor' or 'fair' were from the lowest-income households, had not completed high school, and were employed in unskilled jobs. High-income household women, university graduates, and professionals were more likely than those in any other SES categories to describe their health as 'excellent.'

SOC and Health

The results of the cross-tabulation of health by the collapsed SOC variable (SOC3) are displayed in Table 10. Those with low SOC were more likely to describe their health as 'poor' or 'fair' (21.3%) than those with high SOC (6.0%). A gradient is also evident at the other end of the health scale, with 45.2% of those with low SOC describing their health as 'excellent' or 'very good' compared to 65.5% of those with medium SOC, and 72.9% of those with high SOC. The Kendall's tau-b for ordinal data was significant (Kendall's tau-b = .196, p = .000) as the measure of association.

Table 10

Cross-Tabulation of Self-Rated Health by SOC

	Self-rated health					
	Poor	Fair	Good	Very good	Excellent	Total
Low SOC	61	155	338	330	127	1011
% within row	6.0%	15.3%	33.4%	32.6%	12.6%	100%
Medium SOC	59	293	1223	1786	1205	4566
% within row	1.3%	6.4%	26.8%	39.1%	26.4%	100%
High SOC	9	50	188	324	413	984
% within row	.9%	5.1%	19.1%	32.9%	42.0%	100%
Total	129	498	1749	2440	1745	6561
% within row	2.0%	7.6%	26.7%	37.2%	26.6%	100%

Note. The independent variable is the row variable. Row percentages were requested. Percentages should be examined across the columns. Kendall's tau-b = .196, p = .000. Cases weighted by rescaled weight (wt).

SES and SOC

To identify a relationship between SOC and SES, the SOC means were calculated for each SES category and compared. Analysis of variance (ANOVA) was used to test for differences among the group means, and the Tamhane post hoc comparison procedure was used to determine which of the means were significantly different from the others.

The mean of the SOC variable increased with each increment in the household income adequacy scale, as shown in Figure 3, and the analysis of variance was significant ($F[4, 6307] = 47.75$, $p = .000$). The SOC mean of the lowest-income adequacy group (53.23, SD = 14.08) was significantly lower than that of all other groups except the lower middle-income group (53.43, SD = 14.63). The SOC mean of the highest-income group (60.04, SD = 11.00) was found to be significantly higher than the means of all other income categories. The difference between the middle income (57.69, SD = 12.31) and the upper-middle income group (58.59, SD = 11.83), however, was insignificant.

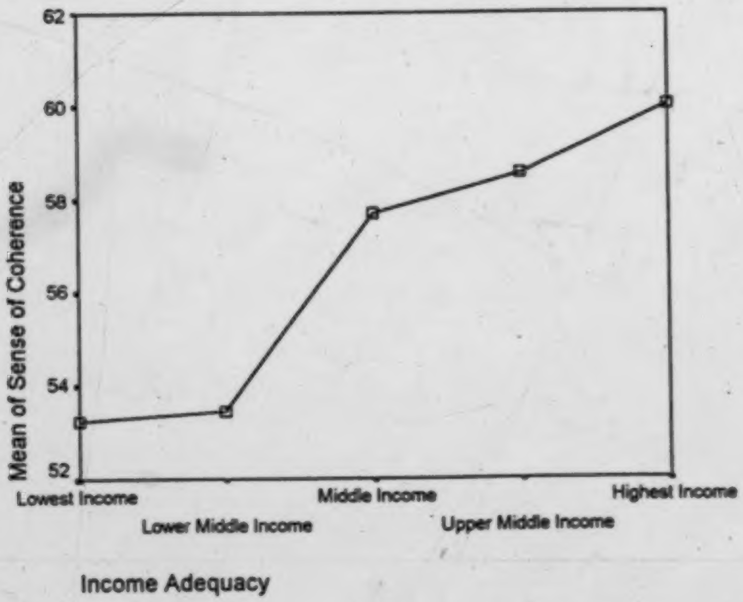


Figure 3. Mean of SOC within income adequacy categories, N = 6312.

The positive relationship between SOC and income is apparent in this bivariate analysis, but it is interesting to also note the difference in the range of SOC scores within income groups. Whereas the lowest income group had a SOC range from 4 to 78, the highest income group's SOC ranged from 21 to 78.

Figure 4 plots the SOC means within the education categories. For this analysis, the education variable that collapsed 'no schooling' and 'less than elementary' was used because of the small group (n = 5) with 'no schooling' who responded to the SOC question. The results of the ANOVA indicate that the difference in means was significant (F [10, 6545] = 10.3, p = .000), and the Tamhane post hoc multiple comparison test revealed a number of significant differences between the means. The SOC mean for the lowest education category (55.48, SD = 16.09) and for the category of those who had not completed high school (56.13, SD = 13.61) were significantly less than the means of the education levels at or above the community college diploma level. The SOC mean difference between those who had completed high school (57.64, SD = 12.77) and those who had completed a bachelor's degree (60.13, SD = 10.95) was also significant. A significantly lower mean was found for those who had some community college (56.54, SD = 12.06) compared to those who had completed college (59.47, SD = 10.78). The mean SOC of those who had 'some trade school' (56.68, SD = 12.84) or 'some community college' (56.54, SD = 12.06) was significantly lower than those who had attained a bachelor, master's, PhD, or medical degree (61.61, SD = 10.47).

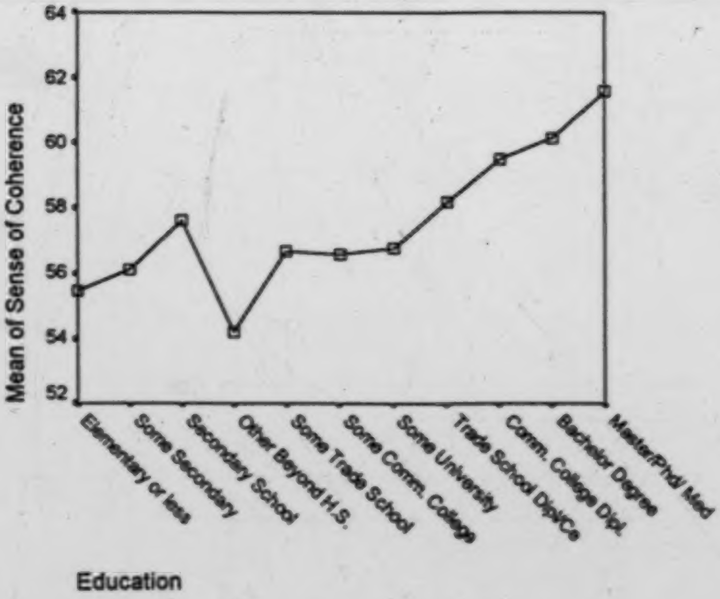


Figure 4. Mean of SOC within education categories, N = 6556.

One interesting trend in these results is noteworthy. Generally, these results indicate that the greater the education, the higher the SOC level. The SOC means of the respondents from the educational categories of 'other beyond high school,' 'some trade,' 'some community college,' and 'some university,' however, were lower than the SOC mean of those who had only a high school education. Although a deviation from the linear trend, this difference in the SOC mean between these groups and the mean of the high school graduates was not statistically significant.

The SOC means for the 16 different occupations were then compared (Figure 5). The differences between the means were significant (F [15, 4558] = 6.47, $p = .000$), and the post hoc multiple comparison tests revealed significant differences in 13 comparisons. Generally, the SOC means of those in the lower occupational categories were lower than those in the higher occupational categories; however, several deviations from this are evident. The SOC means for farm laborers (60.93, SD = 11.86) and farmers (60.72, SD = 11.51) were surprisingly high considering their placement in the occupational hierarchy. It is interesting also to note the relatively low SOC mean (56.48, SD = 11.77) of the highest occupational category, the self-employed professionals. It must be noted, however, that the categories of farmers, farm laborers, and self-employed professionals had a small sample size, and the SOC means of these three categories were not found to be significantly different from the other groups.

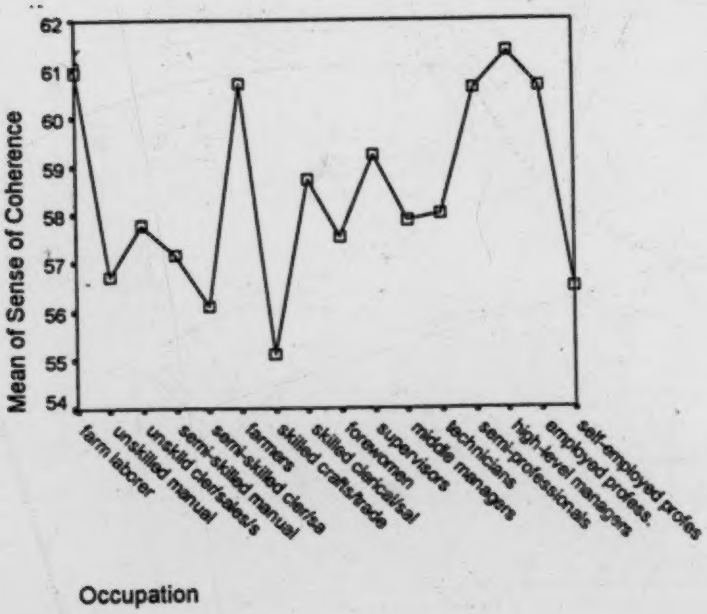


Figure 5. Mean of SOC within occupation categories, N = 4574.

An association between occupation and SOC gradient was more evident when the occupation variable was collapsed into five categories: unskilled, semiskilled, skilled, managerial/technical, and professional (Figure 6), and there was a significant difference between the means (F [4, 4569] = 19.930; p = .000). There were two apparent deviations from a linear association between SOC and health: managerial/technical workers (58.15, SD = 11.01) and semiskilled workers (56.38, SD = 12.47). These SOC means were less than the mean of the category beneath them in the occupational hierarchy, but not statistically significantly different. The semiskilled workers had the lowest SOC level, and this mean was significantly lower than all other categories except the unskilled category. As might be expected, the mean of the professional women (60.58, SD = 10.57) was significantly higher than all other occupational categories.

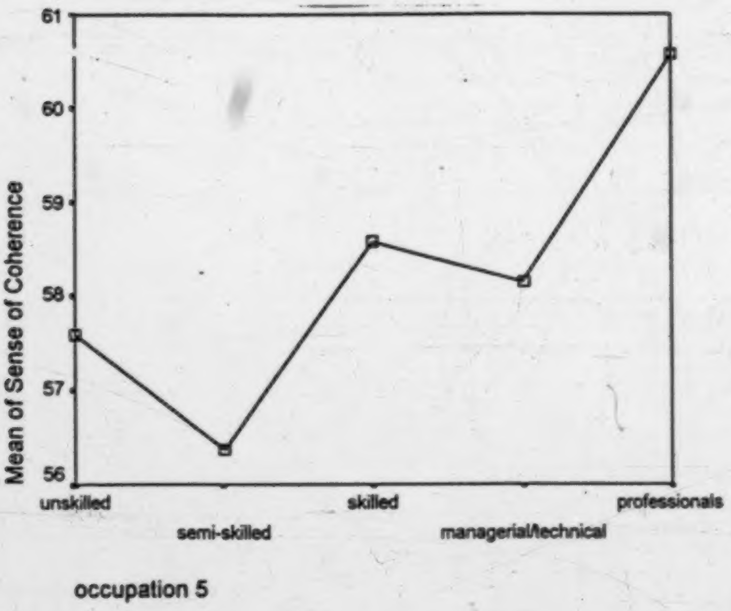


Figure 6. Mean of SOC within five occupation categories, N = 4574.

In summary, the comparison of the SOC mean within the SES categories identified many statistical differences indicative of a positive relationship between SES and SOC. Generally, the SOC mean was lower for those at the lower levels of the SES hierarchy and higher at the upper levels.

Correlations

The Pearson product moment correlations are displayed in Table 11. Analysis was done using pairwise deletion of the missing data. All relationships were significant at the $p < .01$ level. As anticipated, self-rated health was positively correlated with both SOC and the three SES variables. The higher the SOC, income, education, and occupation level, the greater the ratings of health, although the correlation with occupation was not strong (.121). There was a positive but weak ($\underline{r} = .046$) relationship between self-rated health and marital status, with those attached having better health. Not surprisingly, health was negatively correlated with age (r = -.175).

Table 11

Zero Order Correlations Between Self-Rated Health, SOC, Income, Education, Occupation, Marital Status, and Age (N = 4710 to 6846)

Health	SOC	Income	Education	Occupation	Marital status	Age
Self-rated health	.275**	.207**	.204**	.121**	.046**	-.175**
SOC scale	-	.161**	.103**	.109**	.155**	.112**
Income		-	.278**	.283**	.299**	.046**
Education			-	.480**	-.034**	-.163**
Occupation				-	.046**	.069**
Marital Status					-	.152**
Age						-

Note. **p < .01, two-tailed. Cases weighted by rescaled weight (wt). Marital status (attached = 1; unattached = 0).

SOC had a positive relationship with all the variables used in this study, although the correlation coefficients were small. The variable that had the strongest correlation with SOC was self-rated health (r = .275), and, of the SES variables, income had the strongest correlation with SOC (r = .161). There was, however, a stronger correlation between SOC and the dichotomous marital status variable (r = .155) (attached = 1, unattached = 0) than with SOC and the SES variables of education (r = .103) and occupation (r = .109).

As expected, the SES variables of income, education, and occupation were positively correlated with each other. The strongest SES correlation was between education and occupation (r = .480), followed by income and occupation (r = .283) and then income and education (.278). Income and occupation were also positively associated with marital status, yet there was a negative association between education and marital status. Income and occupation were weakly but positively associated with age, but education and age had a negative relationship.

Multivariate Relationships

Multiple regression was used to further explore the relationship of SES, SOC, and health and to address the two main research questions. It was predicted that SOC would be an intervening variable in the SES-health relationship. It was also postulated that SOC would act as a moderator variable and interact with SES to affect health.

Data Screening

Two methods of treating missing data were used. The analysis was conducted using listwise deletion of missing data and repeated by replacing the missing income data with the series mean. The difference between the two results was inconsequential, and thus the results using the listwise deletion of data analysis is reported.

Prior to analysis, various exploratory techniques were used to determine whether or not there were violations of the assumptions important for multiple regression. The data were reviewed for normality, homeoscedasticity, and linearity by plotting the standardized regression residuals against the standardized predicted Y's. Partial plots between the variables were reviewed, and a comparison was also made of the observed and the expected cumulative distributions. The regression residual scatterplot showed a slight deviation from homeoscedasticity, but the relationships between the variables appeared linear. The addition of the quadratic form of the independent variables did not result in a significant R^2 increment. Multivariate normality was then explored by superimposing a normal curve on a histogram of observed frequencies of regression standardized residuals. The histograms of the regressions that included the occupation variable deviated the most from normality. From this analysis, major violations of the underlying assumptions for the statistical tests were not detected.

Multivariate outliers represent an extreme combination of predictor variables and can have an impact on the regressions (Tabachnick & Fidell, 1989). Outliers are defined as standardized residual values of greater than + or - 3 (Polit, 1996) and identified through an analysis of the residuals. It was interesting to note that all the outliers were negative in value, a situation that arises when the observed scores of the dependent variables were lower than expected. These outliers were retained in the sample because elimination did not significantly alter the explained variance.

Research Question #1: Is SOC an Intervening Variable in the SES-Health Relationship?

The first research question addresses the role of SOC as an intervening variable between SES and health by the use of path analysis. Multiple regressions were conducted using SOC and health as dependent variables and the three SES indicators as predictor variables, along with the control variables of age and marital status. This question focused on the identification of an indirect effect of SES on health through SOC. Both standardized and unstandardized coefficients are reported.

Regression analysis using income as the SES variable (Model 1). SOC was first regressed on age, marital status, and income. These three predictor variables explained 4.5% (adjusted $R^2 = .045$) of the variance of SOC (F [3,6308] = 99.060; $p = .000$). The results reveal that income adequacy does indeed contribute to the variance of the SOC variable, controlling for age and marital status (Table 12). For every increase in income quintile, the SOC level increased 1.425 points.

Self-rated health was then regressed on marital status, age, income adequacy, and SOC (Table 13). These predictor variables explained 14.6% (adjusted $R^2 = .146$) of the variance of self-rated health (F [4, 6307] = 271.054; $p = .000$). Both income adequacy and SOC made a statistically significant contribution to the variance in self-rated health, when controlling for marital status and age.

Table 12

Regression Analysis of SOC on Marital Status, Age, and Income (N = 6312)

Variable	B	SE B	β	p
Constant	47.828	.651		.000
Marital status	2.863	.355	.105	.000
Age	.441	.066	.083	.000
Income adequacy	1.425	.149	.124	.000

Note. F [3,6308] = 99.060. Adjusted R^2 = .045; p = .000. Cases weighted by rescaled weight (wt). Marital status (1 = attached; 0 = unattached).

Table 13

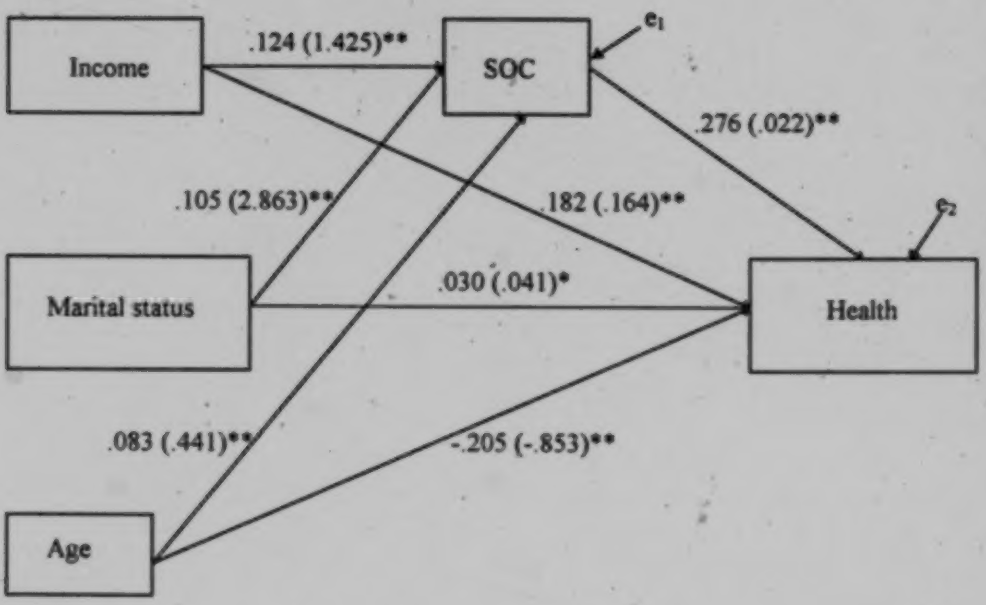
Regression Analysis of Self-Rated Health on Marital Status, Age, Income, and SOC (N = 6312)

Variable	B	SE B	β	p
Constant	2.482	.077		.000
Marital status	.041	.017	.030	.016
Age	- .853	.005	-.205	.000
Income	.164	.011	.182	.000
SOC	.022	.001	.276	.000

Note. F [4, 6307] = 271.054. Adj R^2 = .146; p = .000. Cases weighted by rescaled weight variable (wt). Marital status (1 = attached; 0 = unattached).

Figure 7 presents the path diagram of the model labeled with the path coefficients derived from the regressions above. The exogenous variables of income, marital status, and age can influence health directly, or indirectly by influencing SOC, which in turn influences health. The path model shows that all paths were significant; thus the three exogenous variables all had a direct effect on SOC and on self-rated health. There was also a direct path from SOC to self-rated health. All path coefficients were positive except the path from age to health.

Table 14 examines the direct, indirect, and total effect of the exogenous variables on the endogenous variables of SOC and self-rated health. Note that the direct effects correspond to the path coefficients, and the indirect effects are the product of the variables' direct effect on SOC and the direct effect of SOC on health. The total effects were computed as the sum of the direct and indirect effects. Results confirmed the postulated contribution of income to self-rated health by a direct effect (b = .164), as well as an indirect effect [b = .031 (1.425 x .022)] through SOC. It was calculated that 84% of the total effect of income on health (b = .195) was through a direct effect, but 16% was mediated through SOC. Because a portion of income's effect on health was through SOC, it can be concluded that SOC acted as a mediating or intervening variable in the relationship between income and health.


Income
SOC
Marital status
Health
Age
e_1
e_2
.124 (1.425)**
.276 (.022)**
.105 (2.863)**
.182 (.164)**
.030 (.041)*
.083 (.441)**
-.205 (-.853)**

Note. Standardized and unstandardized path coefficients are reported. Unstandardized coefficients are parenthesized. Unexplained variance = e.

* $p \leq .05$ ** $p \leq .01$ two-tailed test

Figure 7. Path Model 1 with income.

Table 14

Effects of Marital Status, Age, and Income on SOC and Self-Rated Health (N = 6312)

Variable	Unstandardized coefficients			Standardized coefficients		
	Direct	Indirect	Total	Direct	Indirect	Total
			On SOC			
Marital status	2.863		2.863	.105		.105
Age	.441		.441	.083		.083
Income	1.425		1.425	.124		.124
			On self-rated health			
Marital status	.041	.063	.104	.030	.029	.059
Age	-.853	.010	-.843	-.205	.023	-.182
Income	.164	.031	.195	.182	.034	.216
SOC	.022		.022	.276		.276

Note. Indirect effects calculated as product of each variable's direct effect on SOC and SOC's direct effect on health. Total effect calculated as sum of direct and indirect effects.

Regression analysis using education as the SES variable (Model 2). Two multiple regression analyses (Tables 15 and 16) were conducted using the 12-category variable of the highest level of education attained as the SES variable. The path model (Figure 8) was then calculated from the regression data.

The first regression utilized SOC as a dependent variable (Table 15). This regression explained 4.7% of the variance in SOC (F [3, 6550] = 108.594; p = .000), which was very similar to the variance explained with the income variable (4.5%). All of the variables were significant, but the marital status variable exerted the strongest effect on SOC. If one was married or living common-law, the mean of the SOC level increased by almost 4 points. Regression analysis confirmed that education also had a positive relationship with SOC when controlling for the variables of age and marital status. The

Table 15

Regression Analysis of SOC on Age, Marital Status, and Education (N = 6554)

Variable	B	SE	β	p
Constant	47.712	.626		.000
Marital status	3.859	.331	.142	.000
Age	.585	.065	.111	.000
Education	.516	.050	.125	.000

Note. F [3, 6550] = 108.594. Adj. R^2 = .047; p = .000. Cases weighted by rescaled weight variable (wt).

unstandardized coefficients reveal that for every increase in the 12-category education variable, the mean of the SOC value increases only approximately .5.

The second regression regresses self-rated health on SOC, education, age, and marital status (Table 16). This regression explained 13.6% (adjusted R^2 = .136) of the variance of self-rated health (F [4,6549] = 258.341; p = .000), a comparable result to the 14.6% of the variance of health explained when income was employed as the SES indicator. This regression analysis confirmed a positive relationship of the variables of study with health, with the exception of age. Self-rated health increased with each gain in the level of education attained. Also congruent with the findings using the income variable, the variable that exerted the strongest effect on health was SOC. Indeed, a comparison of the unstandardized regression coefficients of SOC when education was entered as the SES indicator (b = .021) and income as the SES indicator (b = .022) reveals almost no difference.

Table 16

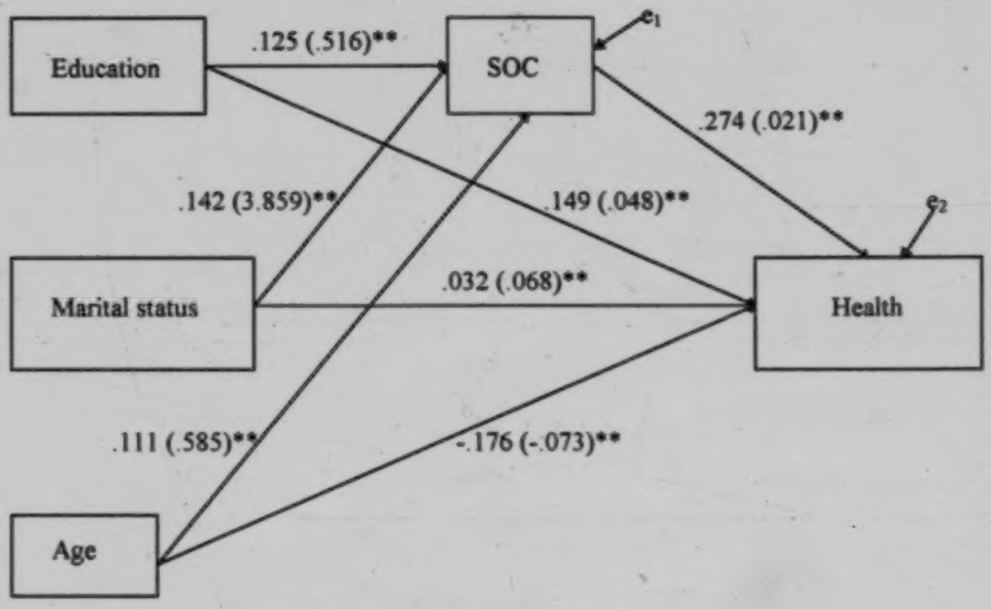
Regression Analysis of Self-Rated Health on Age, Marital Status, Education, and SOC (N = 6554)

Variable	B	SE	β	p
Constant	2.652	.064		.000
Marital status	.068	.025	.032	.006
Age	-.073	.005	-.176	.000
Education	.048	.004	.149	.000
SOC	.022	.001.	.274	.000

Note. F[4, 6549] = 216.035. Adj. R^2 = .136; p = .000. Cases weighted by rescale weight variable (wt).

Path Model 2 (Figure 8) depicts the direct significant effect of education, marital status, and age on SOC and self-rated health. There is also a direct path from SOC to self-rated health. Thus, it can be seen that SOC intervenes in the SES and health relationship when education is used as an SES variable.

The direct, indirect, and total effects of education, marital status and age on SOC and self-rated health were computed and displayed in Table 17. The direct effect of education on health (b = .048) combined with the indirect effect of education through SOC (b = .011) derived the total effect of .059. Thus, for every increase in the 12-category education scale, health would increase .059 on the 5-point health scale. The effect of education through SOC was significant; 18.6% of education's effect on health was mediated through SOC.


Education
SOC
e1
Marital status
Health
e2
Age
.125 (.516)**
.274 (.021)**
.142 (3.859)**
.149 (.048)**
.032 (.068)**
.111 (.585)**
-.176 (-.073)**

Note. Standardized and unstandardized path coefficients are reported. Unstandardized coefficients are parenthesized. Unexplained variance = e.
* $p \leq .05$ ** $p \leq .01$

Figure 8. Path Model 2 with education.

Table 17

Effects of Marital Status, Age, and Education on SOC and Self-Rated Health (N = 6554)

Variable	Unstandardized coefficients			Standardized coefficients		
	Direct	Indirect	Total	Direct	Indirect	Total
	On SOC					
Marital status	3.859		3.859	.142		.142
Age	.585		.585	.111		.111
Education	.516		.516	.125		.125
	On self-rated health					
Marital status	.068	.080	.148	.032	.039	.071
Age	-.073	.010	-.063	-.176	.030	-.146
Education	.048	.011	.059	.149	.034	.183
SOC	.021		.021	.274		.274

Note. Indirect effects calculated as product of each variable's direct effect on SOC and SOC's direct effect on health. Total effect calculated as sum of direct and indirect effects.

Regression analysis using occupation as the SES variable (Model 3). Two regressions were run using the 16-category occupation variable as the SES indicator. The first regression (Table 18) of SOC on marital status, age, and occupation explained 4.3% (adjusted $R^2 = .043$) of the variance of SOC (F [3,4568] = 68.751; $p = .000$), just slightly less than the explained variance when income (adjusted $R^2 = .045$) and education (adjusted $R^2 = .047$) was used as the SES variable. Thus, each of the three regressions explained about the same amount of variance in SOC.

Table 18

Regression Analysis of SOC on Marital Status, Age, and Occupation (Model 3)

(N = 4572)

Variable	B	SE	β	p
Constant	50.243	.610		.000
Marital status	2.960	.378	.116	.000
Age	.622	.081	.113	.000
Occupation	.265	.040	.097	.000

Note. F [3,4568] = 68.751. Adj. R^2 = .043; p = .000. Cases weighted by rescale weight variable (wt).

For the employed women who were represented in this regression, occupation was positively related to SOC when the effects of marital status and age were controlled. For each increase in the 16-category occupation scale, the mean of the SOC value would increase .265. In this group, however, the standardized regression coefficient (β = .097) indicates that occupation had the weakest effect on SOC compared to marital status and age, a result not found when education and income were used as the sole SES indicators.

The second regression used self-rated health as the dependent variable (Table 19). When self-rated health was regressed on marital status, age, occupation, and SOC, only 8.8% (adjusted R^2 = .088) of the variance of self-rated health was explained (F [4, 4567] = 111.724; p = .000). This contrasts to the 14.6% and 13.6% explained variance when income and education, respectively, were used as the SES indicators. It should also be noted that marital status was negatively correlated with health, although the relationship was no longer significant in this regression.

Table 19

Regression Analysis of Self-Rated Health on Marital Status, Age, Occupation, and SOC (Model 3) (N = 4572)

Variable	B	SE	β	p
Constant	2.956	.071		.000
Marital status	-.028	.028	-.014	.325
Age	-.053	.006	-.127	.000
Occupation	.021	.003	.102	.000
SOC	.020	.001	.261	.000

Note. F [4, 4567] = 111.724. Adj. $R^2 = .088$; p = .000. Cases weighted by rescale weight (wt).

In this group of employed women, the results show a positive and significant relationship between occupation and health when controlling for the effects of SOC, marital status, and age. For each category increase in the 16-category occupational hierarchy, the mean of the 5-point health scale also increases .021. This was not as strong an effect on health (β = .102) as that exerted by age (β = -.127) or SOC (β = .261). Nevertheless, it can be concluded that, with working women, a difference in occupation made a difference in health when the effects of SOC, age, and marital status were considered.

SOC exerted the strongest effect on health (β = .261). The unstandardized regression coefficient of SOC in this regression (b = .020) was almost indistinguishable from the SOC coefficient from the regression with income (b = .022) and from the regression with education (b = .021).

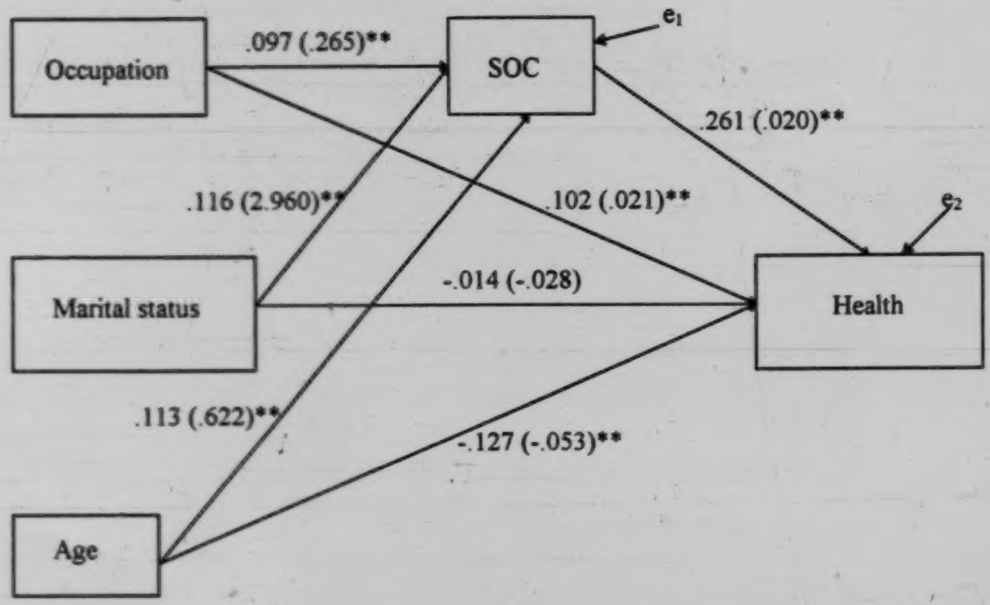
The regression results are plotted on the path model depicted in Figure 9, and all paths are significant, except for the path from marital status to health. There is a direct path from occupation to health, a direct path from occupation to SOC, as well as a path from SOC to health. Thus, SOC intervenes in one of the causal pathways from occupation to health.

The decomposition of the effects are displayed in Table 20. An examination of the size of the indirect effect of occupation on health through SOC (b = .005) suggests that the indirect effect is weak. The different scales of the SES indicators do not allow a direct comparison between SES variables, but the unstandardized indirect effect of the 16-category occupation variable on health was smaller than the indirect effect of the 5-unit income (b = .031) or the 12-unit education (b = .011) variables.

The indirect effect of occupation on health through SOC represented 19.7% of the total effect. This is slightly larger than the proportion attributed to the indirect effect on health though SOC using the income variable (16%) or the education variable (18.6%). The comparison of results, of course, is difficult considering the varying sample size that occurs with the use of different SES variables. Regardless, there is an indirect effect of occupation on health through SOC, and thus SOC can be considered as an intervening variable.

To summarize the results of the three models, the regression results have identified SOC as a variable that mediates some of the effects of socioeconomic status on health when income, education, and occupation were each used as the sole SES indicator. All of the SES variables had a direct effect on SOC. The regressions of SOC on SES controlling for marital status and age explained a similar proportion of variance in SOC when income (4.5%), education (4.7%), and occupation (4.3%) were each used as the sole SES indicator. The three regressions of self-rated health on SOC and an SES indicator, controlling for marital status and age, revealed that these variables had a direct effect on health, but the amount of explained variance differed. The regression with income explained the most variance (14.6%), followed by education (13.6%) and then occupation (8.8%). The effect that SOC had on health appeared relatively constant in the three regressions. The decomposition of effects indicated that each of the SES variables exerted

S


Occupation
.097 (.265)**
SOC
e1
.261 (.020)**
.116 (2.960)**
.102 (.021)**
e2
Marital status
-.014 (-.028)
Health
.113 (.622)**
-.127 (-.053)**
Age

Note. Standardized and unstandardized path coefficients are reported. Unstandardized coefficients are parenthesized. Unexplained variance = e.
$* p \leq .05$ $** p \leq .01$

Figure 9. Path Model 3 with occupation.

Table 20

Effects of Marital Status, Age, and Occupation on SOC and Self-Rated Health

	Unstandardized coefficients			Standardized coefficients		
Variable	Direct	Indirect	Total	Direct	Indirect	Total
			On SOC			
Marital status	2.960		2.960	.116		.116
Age	.622		.622	.113		.113
Occupation	.265		.265	.097		.097
			On self-rated health			
Marital status		.059	.059		.030	.030
Age	-.053	.012	-.041	-.127	.029	-.098
Occupation	.021	.005	.026	.102	.025	.127
SOC	.020		.020	.261		.261

Note. Indirect effects calculated as product of each variable's direct effect on SOC and SOC's direct effect on health. Total effect calculated as sum of direct and indirect effects.

an indirect effect on health through SOC. The proportion of the total effect on health that was mediated through SOC for the income, education, and occupation variables was 16%, 18.6%, and 19.7%, respectively.

Regression analysis using income, education, and occupation as the SES variables (Models 4 and 5). It is assumed in regression analysis that the variables not specified in the model, and subsumed under the error term, are not correlated with variables within the model. All three of these SES indicators are correlated. Occupation is correlated with income (r = .283; p = .000) and education (r = .480; p = .000). Education and income are also correlated (r = .278; p = .000). To further the understanding of the unique contribution that each of the SES indicators has on SOC and self-rated health, all of the SES variables were added to the regression (Model 4). To retain the sample size and to better reflect the total population that includes both employed and nonemployed women, Model 5 includes only the income and education SES variables.

The regression results using SOC as the dependent variable are displayed in Table 21. All coefficients were statistically significant. The age and marital status variables exerted the strongest effect on SOC in Model 4, but the effect of education (β = .103) and age (β = .100) were equivalent in Model 5.

Table 21

Regression Analysis of SOC on Marital Status, Age, Income, Education, and Occupation

	Model 4				Model 5			
Variable	B	SE	β	p	B	SE	β	p
Constant	46.622	.859		.000	45.460	.713		.000
Marital status	2.680	.401	.105	.000	3.154	.355	.116	.000
Age	.641	.084	.116	.000	.531	.067	.100	.000
Income	.613	.190	.052	.001	1.049	.156	.091	.000
Education	.355	.069	.088	.000	.427	.054	.103	.000
Occupation	.121	.047	.044	.011				

Note: Model 4 adjusted R^2 = .050; F [5, 4400] = 47.424; p = .000, n = 4406. Model 5 adjusted R^2 = .054; F [4, 6304] = 90.833; p = .000, n = 6309. Cases weighted by rescaled weight variable (wt).

When SOC was regressed on all three SES variables, controlling for marital status and age (Model 4), education had the strongest effect on SOC (β = .088) compared to income (β = .052) and occupation (β = .044). Although statistically significant, this effect is relatively small, particularly the effect of occupation on SOC. For each increase in the 16 occupation categories, the SOC level would increase .121 points on a 78-point scale when controlling for the other variables. When just income and education were used as

SES indicators (Model 5), the effect of income ($\beta = .091$) was comparable to the effect of education ($\beta = .103$) on SOC. Model 4 explained 5% of the variance in SOC, and Model 5 explained 5.4%.

Table 22 displays the regression results of self-rated health on SOC and three SES variables (Model 4), and of self-rated health on SOC and two SES variables (income and education; Model 5) while controlling for the effects of marital status and age. The utilization of three SES indicators in Model 4 renders the effect of the occupation variable on self-rated health statistically and substantially insignificant ($b = .005$, $p = .174$). Income ($\beta = .099$) and education ($\beta = .098$) exerted similar effects on health. When occupation was omitted from the regressions (Model 5), income exerted a greater effect ($\beta = .147$) than education ($\beta = .108$), and the effect of marital status on self-rated health became insignificant. The effect of SOC on health in Model 4 ($b = .019$) was comparable to the effect on health in Model 5 ($b = .021$), demonstrating the consistent and strong effect of SOC on health that varied little with the number or type of SES indicators entered in the regressions.

Model 4 had one more SES indicator (occupation) than Model 5 did; however, contrary to the effect that is usually seen with the entry of another predictor variable, Model 4 explained less variance (adjusted $R^2 = .107$) than Model 5 (adjusted $R^2 = .156$). This highlights the difference of the sample size and sample characteristics between Model 4 with the occupation variable ($n = 4406$) and Model 5 without occupation ($n = 6314$).

Table 22

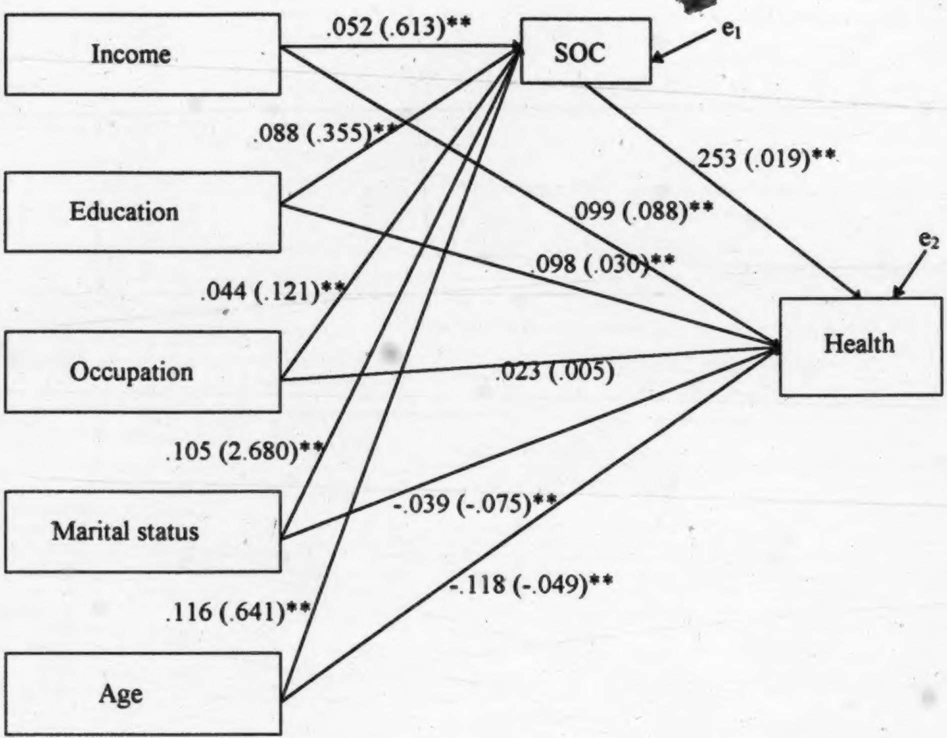
Regression of Self-Rated Health on Marital Status, Age, Income, Education, Occupation, and SOC

	Model 4				Model 5			
Variable	B	SE	β	p	B	SE	β	p
Constant	2.613	.081		.000	2.421	.068		.000
Marital status	-.075	.029	-.039	.011	-.024	.026	-.011	.372
Age	-.049	.006	-.118	.000	-.076	.005	-.183	.000
Income	.088	.014	.099	.000	.132	.012	.147	.000
Education	.030	.005	.098	.000	.035	.004	.108	.000
Occupation	.005	.003	.023	.174				
SOC	.019	.001	.253	.000	.021	.001	.265	.000

Note: Model 4: adjusted $R^2 = .107$; F [6, 4399] = 89.180; p = .000, n = 4406. Model 5: adjusted $R^2 = .156$; F [5, 6308] = 233.868; p = .000, n. = 6314.

The path model for Model 4 is depicted in Figure 10. There were direct significant paths from all of the variables to SOC, and from SOC to health. Thus, SOC acted as an intervening variable. There was no significant direct path from occupation to health in this model; however, occupation continued to exert an effect on health indirectly through the mediating variable of SOC.

The direct, indirect, and total effects of Model 4 are reported in Table 23. When health was regressed on the three SES variables, income and education had an equivalent direct effect. The indirect effect mediated through SOC, however, was greater for education (β = .022) than for income (β = .013). This resulted in a total effect of education on health (β = .120) that was slightly greater than the total effect of income (β = .112). The indirect effect of education through SOC, 18.3% of its total effect on


Income
.052 (.613)**
SOC
e1
.088 (.355)**
253 (.019)**
Education
099 (.088)**
e2
.098 (.030)**
.044 (.121)**
Health
Occupation
.023 (.005)
.105 (2.680)**
-.039 (-.075)**
Marital status
-.118 (-.049)**
.116 (.641)**
Age

Note. Standardized and unstandardized path coefficients are reported. Unstandardized coefficients are parenthesized. Unexplained variance = e.
* $p \leq .05$ ** $p \leq .01$

Figure 10. Path Model 4 with income, education, and occupation.

Table 23

Effects of Marital Status, Age, Income, Education, and Occupation on Self-Rated Health and SOC (Model 4)

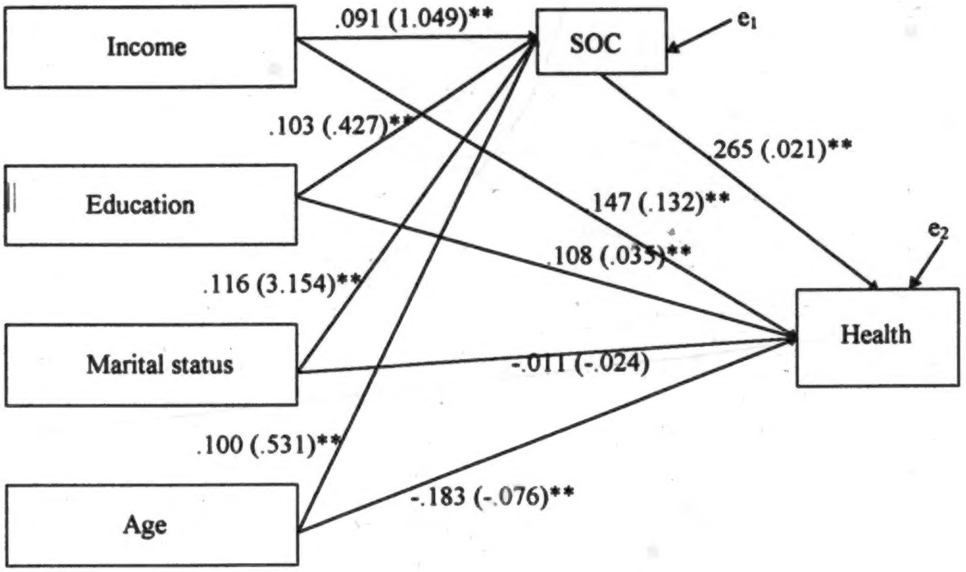
Variable	Unstandardized coefficients Direct	Unstandardized coefficients Indirect	Unstandardized coefficients Total	Standardized coefficients Direct	Standardized coefficients Indirect	Standardized coefficients Total
			On SOC			
Marital status	2.680		2.680	.105		.105
Age	.641		.641	.116		.116
Income	.613		.613	.052		.052
Education	.355		.355	.088		.088
Occupation	.121		.121	.044		.044
			On self-rated health			
Marital status	-.075	.051	-.024	-.039	.027	-.012
Age	-.049	.012	-.037	-.118	.029	-.089
Income	.088	.012	.100	.099	.013	.112
Education	.030	.007	.037	.098	.022	.120
Occupation		.002	.002		.011	.011
SOC	.019		.019	.253		.253

Note. Indirect effects calculated as product of each variable's direct effect on SOC and SOC's direct effect on health. Total effect calculated as sum of direct and indirect effects.

health, boosted the effect that education had on health. The indirect effect of income on health through SOC, however, was only 11.6% of income's total effect. The direct effect of occupation on self-rated health was statistically insignificant when the income and education variables were used in the model, but there remained a small indirect effect (b = .002; β = .011) through SOC. All of the effect of occupation on health was through SOC.

The path model for Model 5, which omits occupation and uses only income and education as the SES variables, is depicted in Figure 11. The path coefficients were derived from the regressions of SOC and self-rated health as reported in Tables 21 and 22. As with the other models, there were two pathways from the variables to health: a direct path and a path through SOC. In this model, marital status had only an indirect path through SOC, because the direct path to health was insignificant. Both income and education had a direct and an indirect path to health.

Table 24 presents the indirect, direct, and total effects on the endogenous variables of Model 5. The decomposition of effects revealed some differences between Models 4 and 5. Whereas education had the greatest total effect on health in Model 4, in this model income had the stronger total effect (β = .171) on self-rated health compared to education (β = .135). The indirect effects of education (β = .027) and of income (β = .024) of Model 5, however, were equivalent. The SOC variable mediated 14% of the total effect of income on self-rated health and 20% of the total effect of education on health.


Income
.091 (1.049)**
SOC
e1
.103 (.427)**
.265 (.021)**
Education
.147 (.132)**
e2
.108 (.035)**
.116 (3.154)**
Health
Marital status
-.011 (-.024)
.100 (.531)**
-.183 (-.076)**
Age

Note. Standardized and unstandardized path coefficients are reported. Unstandardized coefficients are parenthesized. Unexplained variance = e.
* $p \leq .05$ ** $p \leq .01$

Figure 11. Path Model 5 with income and education.

Table 24

Effects of Marital Status, Age, Income, and Education on SOC and Self-Rated Health (Model 5)

	Unstandardized coefficients			Standardized coefficients		
Variable	Direct	Indirect	Total	Direct	Indirect	Total
			On SOC			
Marital status	3.154		3.154	.116		.116
Age	.531		.531	.100		.100
Income	1.049		1.049	.091		.091
Education	.427		.427	.103		.103
			On self-rated health			
Marital status		.066	.066		.031	.031
Age	-.076	.011	-.065	-.183	.027	-.156
Income	.132	.022	.154	.147	.024	.171
Education	.035	.009	.044	.108	.027	.135
SOC	.021		.021	.265		.265

Note. Indirect effects calculated as product of each variable's direct effect on SOC and SOC's direct effect on self-rated health. Total effect was calculated as the sum of the direct and indirect effects.

Summary of the five path models. In summary, five path models were used to identify the role of SOC as an intervening variable. The path models differed by the employment of the various SES variables. Income (Model 1), education (Model 2), and occupation (Model 3) were each used as the sole SES indicator in the first three models. All of the SES variables were then entered into the regressions in Model 4. Model 5 used only income and education to utilize the full sample of both employed and nonemployed women.

All five models showed that there was a direct path from SES to SOC, regardless of the number or type of SES variables entered into the model. The regressions of SOC on a single SES indicator, controlling for marital status and age, explained a similar proportion [income (4.5%), education (4.7%), and occupation (4.3%)] of the variance of SOC. When all three SES indicators were used in Model 4, the regression explained 5.0% of the variance in SOC, which was less than the variance explained in Model 5 (5.4%) that added only two SES indicators (income and education).

There were also direct paths from income, education, and occupation to self-rated health. The regressions of self-rated health on SOC, SES, marital status, and age indicated significant relationships between SES and health. Occupation, however, although exerting a direct significant effect on health (b = .021, p = .000) in Model 3, did not have a significant direct effect in Model 4 (b = .005, p = .174) when controlling for income and education. Thus, there was no unique contribution to health that could be attributed to occupation when education and income were added to the regression.

The amount of explained variance in self-rated health differed depending on the SES variable component. The first two models that used income (14.6%) and education (13.6%) as the sole SES indicator explained a similar amount of variance; and, used together (Model 5), they explained 15.6% of variance in health. The regression with occupation as the sole SES indicator (Model 3) explained the least amount of variance in health (8.8%); and even when education and income were added to the model (Model 4), only 10.7% of the variance in health was explained when the truncated sample of only employed women was used.

In every regression of self-rated health on SOC, SES, marital status, and age, SOC exerted a strong and consistent effect on health. The unstandardized regression coefficient of the SOC variable ranged from .019 in Model 4 with all three SES variables to .022 in the regression with income. SOC was also the variable that exerted the strongest effect on health. The standardized regression coefficients for SOC ranged from .276 in the regression with income, to .253 with income, education, and occupation.

All five path models revealed that SOC mediated the effects of SES on health. The regressions showed that there was a direct path from SES to SOC, as well as a strong effect of SOC on health. Each of the three SES indicators exerted an indirect effect on health through the SOC variable. When only one SES indicator was used, 16% of income's total effect on health was through SOC, 18.6% of education's, and 19.7% of occupation's. When all three variables were used, 11.6% of income's effect on health was mediated through SOC, and 18.3% of education's. In this model (4), 100% of occupation's effect on health was mediated through SOC, because there was no direct effect on health from occupation. When income and education were entered as the SES component in Model 5, most of income's effect on health was through a direct effect (86%), but education's indirect effect through SOC represented 20% of its total effect on health. The indirect effects through SOC accounted for a small proportion of the total effects on health. The path model analysis supports the assertion that SOC mediates a portion of the effect of the SES variables on self-rated health.

Research Question #2: Does the Relationship Between SES and Health Vary as a Function of SOC?

To evaluate this hypothesized moderated relationship, Jaccard et al. (1990) recommended addressing three issues: (a) the presence of an interaction in the sample data, (b) the strength of the effect, and (c) the nature of the effect. To identify statistical interaction, multiplicative interaction terms were added to the regressions, and the hierarchical F test (F Δ) was used to determine statistical significance. The strength of the effect was measured by the difference of the squared multiple correlations (R^2 Δ) when the interaction terms were used. To discern the nature of the effect, the slope or the b of the interaction term was examined.

The presence of an interaction was first explored by entering centered multiplicative product terms into a regression with their centered component parts. These interaction terms were equal to the product of the centered SES variable and the centered SOC variable and had low correlations with their component parts.

Subgroup analysis was also conducted as an alternative approach to product-term analysis (Jacard et al., 1990). Three groups were created by using the SOC 3 variable. The unstandardized coefficient for the SES variable was compared across the low SOC, medium SOC, and high SOC groups. The difference between the slopes and the statistical significance of this difference were calculated using equation 7:

$$t = \frac{b_1 - b_2}{[SE_{b1}^2 + SE_{b2}^2]^{1/2}}$$

The interaction of income and SOC. The results of the hierarchical regression of self-rated health on marital status, age, and income and the cross-product term are displayed in Table 25. When added to the regression, the Income x SOC term was statistically insignificant (b = .0003, p = .732), and there was no change in the amount of explained variance ($R^2\ \Delta = .000$, p = .732).

Subgroup analysis also failed to detect an interaction between income and SOC. The sample was split into three levels of SOC. Self-rated health was then regressed on income, marital status, and age for each of the groups. Table 26 presents the results of the regressions as well as the means of the variables. The unstandardized regression coefficient representing the effect of income on health in the high SOC group (.180) was only slightly higher than in the medium SOC (.170) and low SOC (.171) groups. Each of the unstandardized regression coefficients for the income variables were then statistically compared with the income coefficient from the other SOC groups by using the t test identified in equation 7. The three t tests were all insignificant and ranged from .031 for the difference between low and medium SOC to .31 for the difference between medium

Table 25

Hierarchical Regression Analysis of Self-Rated Health on Marital Status, Age, Income, and Income x SOC

Variable	B	SE	β	p	ΔR^2	F Δ	p of F Δ
Step 1					.146	270.386	.000
Constant	4.375	.037		.000			
Marital status	-.049	.026	-.023	.062			
Age	-.084	.005	-.202	.000			
Income	.162	.011	.180	.000			
SOC	.022	.001	.275	.000			
Step 2					.000	.118	.732
Constant	4.374	.037		.000			
Marital status	-.049	.026	-.023	.064			
Age	-.084	.005	-.202	.000			
Income	.163	.011	.181	.000			
SOC	.022	.001	.276	.000			
Income x SOC	.0003	.001	.004	.732			

Note. Step 1: $F[4, 6307] = 270.386$, $p = .000$, $N = 6312$. Step 2: $F[5, 6306] = 216.302$, $p = .000$. Cases weighted by rescaled weight (wt).

Table 26

Regression Analysis of Self-Rated Health on Marital Status, Age, and Income by Three Groups of SOC

Variable	Mean	B	SE	β	p	Adjusted R^2	F	p
Low SOC						.061	22.138	.000
Constant		3.220	.128		.000			
Marital status	.56	.033	.071	.015	.645			
Age	6.19	-.075	.014	-.167	.000			
Income	3.10	.171	.030	.185	.000			
Medium SOC						.074	117.865	.000
Constant		3.814	.058		.000			
Marital status	.70	-.070	.031	-.034	.024			
Age	6.52	-.081	.006	-.204	.000			
Income	3.49	.170	.013	.195	.000			
High SOC						.079	27.846	.000
Constant		4.024	.137		.000			
Marital status	.80	.060	.076	.026	.431			
Age	6.97	-.087	.013	-.217	.000			
Income	3.61	.180	.030	.197	.000			

Note. Low SOC: Mean of self-rated health = 3.302, n = 983. Medium SOC, Mean of self-rated health = 3.83, n = 4394. High SOC, Mean of self-rated health = 4.12, n = 935. Cases weighted by rescaled weight variable (wt).

SOC and low SOC. Thus, a difference in the income and health relationship between SOC groups was not identified.

The subgroup analysis also shows that the three SOC groups differed in other characteristics. The mean of income in the low SOC group (3.10) was lower than the mean of the medium SOC (3.49) and high SOC (3.61). This difference in the means of income between SOC groups is indicative of the positive relationship between income and SOC. The mean of the age and marital status variables also increased with each SOC group, again reflecting the positive relationship of age and marital status with SOC.

The interaction of education and SOC. Table 27 presents the summary of the hierarchical regression analysis using education as the SES variable. There was no change in the amount of explained variance ($R^2 \Delta = .000$) with the addition of the Education x SOC term, and the probability of the $\underline{F}$ change was not significant ($\underline{p} = .479$). The slope of the interaction term was small and statistically insignificant ($\underline{b} = .0002$, $\underline{p} = .479$). The presence of an interaction between education and SOC was not detected through hierarchical regression analysis with a cross-product term.

Self-rated health was then regressed on education, marital status, and age for the three groups of SOC (Table 28), and the effects of education on health were compared. The slopes of the education variable varied slightly among the three groups (.048 for the low SOC, .051 for the medium SOC, and .055 for the high SOC), but the differences were not statistically significant. The $\underline{t}$ values ranged from .041 for the difference between the low SOC and the high SOC groups and .223 for the difference between the low and medium SOC groups. As the effects of education on health did not vary substantially with the level of SOC, an interaction effect was not identified.

Table 27

Hierarchical Regression Analysis of Self-Rated Health on Marital Status, Age, Education, SOC, and Education x SOC

Variable	B	SE	β	p	$R^2\Delta$	F Δ	p of F Δ
Step 1					.136	258.341	.000
Constant	4.219	.036		.000			
Marital status	.068	.025	.032	.006			
Age	-.073	.005	-.176	.000			
Education	.048	.004	.149	.000			
SOC	.022	.001	.274	.000			
Step 2					.000	.501	.479
Constant	4.219	.036		.000			
Marital status	.068	.025	.032	.006			
Age	-.073	.005	-.176	.000			
Education	.048	.004	.148	.000			
SOC	.022	.001	.276	.000			
Education x SOC	.0002	.000	.008	.479			

Note. N = 6553. Step 1, F [4,6549] = 258.341, p = .000. Step 2, F[5,6548] = 206.757, p = .000. Cases weighted by rescaled weight (wt).

Table 28

Regression Analysis of Self-Rated Health on Marital Status, Age, and Education by Three Groups of SOC

Variable	Mean	B	SE	β	p	Adjusted R^2	F	p
Low SOC						.048	17.901	.000
Constant		3.373	.126		.000			
Marital status	.56	.189	.067	.088	.005			
Age	6.17	-.075	.014	-.166	.000			
Education	5.91	.048	.012	.128	.000			
Medium SOC						.064	104.969	.000
Constant		3.881	.057		.000			
Marital status	.70	.046	.030	.023	.119			
Age	6.54	-.067	.006	-.169	.000			
Education	6.93	.051	.005	.165	.000			
High SOC						.079	29.253	.000
Constant		4.093	.130		.000			
Marital status	.79	.191	.071	.083	.007			
Age	6.99	-.074	.013	-.183	.000			
Education	6.76	.055	.009	.187	.000			

Note. Low SOC: Mean of self-rated health = 3.30, n = 1011. Medium SOC, Mean of self-rated health = 3.83, n = 4560. High SOC, Mean of self-rated health = 4.10, n = 983. Cases weighted by rescaled weight (wt).

The means of variables within the subgroups were then examined. The regression of SOC on education, marital status, and age (Table 15) indicates a positive relationship between the 12-category education variable and SOC (b = .516); that is, the higher the education, the greater the SOC. The calculation of the means in this subgroup analysis was not entirely consistent with this relationship. Predictably, the mean of the low SOC education variable (5.91) was less than the other SOC groups. The education mean of the medium SOC (6.93), however, was slightly greater than the mean of the high SOC group (6.76).

The interaction of occupation and SOC. Finally, the SES variable of occupation was explored as a variable that may interact with SOC to vary the nature of the SES-health relationship. Table 29 summarizes the results of the hierarchical regression that used occupation as the SES variable and Occupation x SOC as the product term. The change in the explained variance with inclusion of the product term was measurable but small ($R^2\ \Delta = .001$; F change = 4.89, $p = .027$). This means that the interaction effect accounted for .1% of the variance in self-rated health, a very small effect size.

The slope of the product term indicates how the relationship between occupation and health varies across the SOC levels. For every SOC unit increase, the slope of health on occupation changes .0006 (Jacard et al., 1990). Although the size of the coefficient indicates that the slope changes very little per unit change in SOC, the positive nature of this product term regression coefficient indicates that at higher levels of SOC, the slope increases. At high SOC levels, therefore, occupation has a greater positive effect on health.

Table 29

Hierarchical Regression Analysis of Self-Rated Health on Marital Status, Age, Occupation, and Occupation x SOC

Variable	B	SE	β	p	$R^2\Delta$	F Δ	p of F Δ
Step 1					.089	111.72	.000
Constant	4.264	.041		.000			
Marital status	-.028	.028	-.014	.325			
Age	-.053	.006	-.127	.000			
Occupation	.021	.003	.102	.000			
SOC	.019	.001	.261	.000			
Step 2					.001	4.89	.027
Constant	4.259	.041		.000			
Marital status	-.026	.028	-.013	.352			
Age	-.053	.006	-.127	.000			
Occupation	.020	.003	.099	.000			
SOC	.020	.001	.265	.000			
Occupation x SOC	.0006	.000	.032	.027			

Note. N = 4571. Step 1, F [4,4567] = 111.724. Step 2, F[5,4566] = 90.433. Cases weighted by rescaled weight (wt).

The sample was then split by the three SOC levels, and the unstandardized coefficients of the occupation variable were compared (Table 30). The slope of the high SOC (b = .034) was greater than the coefficients for the medium SOC (b = .023) and the low SOC (b = .005) groups. The difference between the slope of the occupation variable in the low SOC group was statistically different from the slope of the high SOC group ($t = 2.37$, $p < .05$). The slopes of the low SOC and the medium SOC were also significantly different ($t = 2.2$, $p < .05$), but the difference between the medium SOC and the high SOC were statistically insignificant ($t = 1.447$, $p > .05$). The comparison of the

Table 30

Regression Analysis of Self-Rated Health on Marital Status, Age, and Occupation by Three Groups of SOC

Variable	Mean	B	SE	β	p	Adjusted R^2	F	p
Low SOC						.003	1.611	.186
Constant		3.699	.125		.000			
Marital status	.58	-.001	.080	-.001	.985			
Age	5.77	-.038	.018	-.086	.040			
Occupation	6.73	.005	.010	.022	.585			
Medium SOC						.024	28.125	.000
Constant		4.069	.053		.000			
Marital status	.70	-.031	.033	-.016	.351			
Age	6.18	-.047	.007	-.116	.000			
Occupation	8.02	.023	.003	.115	.000			
High SOC						.050	12.767	.000
Constant		4.306	.135		.000			
Marital status	.79	.066	.081	.031	.414			
Age	6.62	-.058	.015	-.146	.000			
Occupation	8.17	.034	.007	.176	.000			

Note. Low SOC: Mean of self-rated health = 3.52, n = 623. Medium SOC: Mean of self-rated health = 3.94, n = 3279. High SOC: Mean of self-rated health = 4.25, n = 671. Cases weighted by rescaled weight (wt).

slopes of health on occupation among the three groups with differing SOC levels indicated that the slope of the low SOC group is statistically lower than the other groups. Indeed, at low levels of SOC, there was no relationship between occupation and health. The effect of occupation on health, then, varied with the SOC level.

The computation of the means of the variables for each SOC group provided an opportunity to explore the characteristics of women with varying levels of SOC. From this analysis, it is evident that the mean of age, marital status, and occupation increased as the SOC group increased. The mean of the 16-category occupation variable was 6.73 for the low SOC group, 8.02 for the medium SOC group, and 8.17 for the high SOC group. A similar effect was evident with the mean of the income and education variables. In sum, women with low levels of SOC may be more likely to be from low household income levels, less educated, employed in lower occupational status jobs, younger, and less likely to be attached. Although this confirms the results from the zero-order correlations, the data from this analysis indicate that the difference between means of the medium SOC and high SOC groups may not be as substantial as the difference between the means of the low SOC and the other groups.

Summary. In summary, to answer the second research question, the SOC variable was explored as a moderating variable that modifies the nature of the SES-health relationship. This relationship was addressed by using the SES x SOC product term in hierarchical regression and by subgroup analysis whereby the effect of SES variables on health was compared across three SOC levels. The results did not discern an interaction of the SOC variable with the income and education variables. However, there was a statistically significant interaction effect of SOC on the occupation and health relationship. At low levels of SOC an increase in occupation category did not result in greater health. At higher levels of SOC an increase in occupation did result in greater self-rated health. However, the difference was very small. A parsimonious explanation for the effect of SOC on the SES and health relationship would be to say that SOC exerts a main, rather than a moderator, effect on the SES and health relationship.

CHAPTER 5

DISCUSSION

This secondary data analysis of the 1994-1995 NPHS survey was conducted to examine the relationship between selected measures of socioeconomic status, sense of coherence, and self-rated health in Canadian women aged 20 to 64. In this chapter I discuss the findings, using the existing literature as a backdrop. The chapter concludes with a discussion of the limitations of this study, recommendations for further research, and the implications for nursing.

The bivariate and multivariate analysis revealed associations between the study variables of SOC, income, education, occupation, age, and marital status with self-rated health. Of particular importance to the role as SOC as a mediator and as a moderator in the SES and health relationship is the relationship between SES and health, and SOC and health.

The SES and Health Relationship

The underlying supposition of the two main research questions is that there is a link between socioeconomic status and health. Given the mounting evidence for socioeconomic disparities in health, the results from this study are perhaps not too surprising. The findings from the bivariate analysis reveal a socioeconomic status and health gradient, and the multivariate analysis confirms a relationship among the three SES indicators of income, education, and occupation with self-rated health. More specifically, this study found evidence to support the premise that income, education, and occupation are determinants of health in Canadian women.

The association between income and health cannot be disputed. About three quarters (75.1%) of the highest income quintile reported 'very good' or 'excellent' health, compared to just under half (49.2%) of the lowest income quintile. At the other end of the health scale, the women in the lowest income group were about five times more likely to report ‘poor’ or ‘fair’ health (18.9%) than were those in the highest income quintile (3.8%). Not only was this inequity evident by comparing the top and bottom income quintiles, but with each increase in income category, the frequency of reporting ‘poor’ or ‘fair’ health decreased. It appears that there is a linear relationship between income and health that is consistent with the gradient effect observed in SES and health relationships (Adler, 1994; MacIntyre, 1996). Even when income, education, occupation, SOC, marital status, and age were controlling for one another in the multivariate analysis, there was a significant income and health relationship. Thus, regardless of a woman’s education, occupation, SOC, age, or marital status, a low income was detrimental to her health. This observation of a persistent relationship between income and self-rated health when controlling for education and demographic variables is consistent with Cairney & Arnold’s (1998) study in working-age Canadians.

Health inequities based on education were also evident. The women who had not completed high school were almost five times more likely to report ‘poor’ or ‘fair’ health (18.9%) than were those with a university degree (4%). Again a gradient effect was observed. The relationship between education and self-rated health persisted even when controlling for income, occupation, SOC, marital status, and age. This finding is congruent with the evidence from Canada (Cairney & Robert, 1998) and the U.K. (Arber, 1996) that reports a relationship between education and self-rated health, even when the effects of other SES indicators that measured financial resources and demographic variables were held constant. This observation lends support to the contention that material or economic resources may be only part of the explanation for the SES and health relationship (Evans, 1994; Ross & Wu, 1995; Wilkinson, 1996), because education made a significant independent contribution to health.

The findings from this study also reveal a link between occupation and health. The professional workers were more likely to report better health than were the women employed in jobs that did not require specific skills. This association between health and occupation was evident even after controlling for marital status, age, and SOC. This study did not find evidence to support Arber's (1991) British study that described a curved occupational class gradient for women, but the findings are congruent with the study conducted by Macran et al. (1996), which described significantly better self-rated health in British women whose current or last job was in nonmanual occupations than in the unskilled group (controlling for age, employment status, and household composition).

The results also point to differences between the relationship of occupation and health and the relationships of the other SES variables and health. The gradient effect was not as obvious between the occupational categories in the middle of the hierarchy. This study concurs with Arber's (1996) British study which noted that the occupational class gradient of women's self-rated health was not as sharp as the gradient evident in health when educational classification was used.

Although occupation had a significant effect on health when controlling for SOC, marital status, and age, occupation (along with SOC, MS, and age) did not explain as much variance in health as did income or education. This effect was evident even when all three SES variables were entered into the regressions. Thus, for the truncated sample of only employed women, the SES variables were not as effective in explaining the variance in health. This study also found that the frequency of response for each self-rated health category varied between the employed women and the total sample. Ross & Wu (1995) stated that a sample of employed women "eliminates the most disadvantaged: those who are unemployed, those who are engaged in unpaid domestic labor, or retired" (p. 721). They concluded that this results in less variation in SES, and thus the effect of SES inequality on health is attenuated. Arber (1996) also found that excluding the nonemployed women from the analyses of the effects of SES on health would weaken the class inequalities; however, not to the same degree as with men. This supports the observation from this study, while also acknowledging that this study did not include older women.

This finding raises the question about the difference between the health of the employed versus the nonemployed, an issue that has been described as complex in women (Arber, 1991). Employment is hypothesized to lead to either health benefits from participation in a socially valued activity or detrimental health effects as women attempt to balance their domestic and work obligations (Arber, 1991; Bartley, Popay, & Plewis, 1992). Longitudinal data from the U.S. has found that full-time employment predicted slower declines in self-rated health for women (Ross & Mirowsky, 1995). However, reverse causation has not been ruled out in the health of homemakers (Arber, 1991, 1996). Responsibilities for children, domestic conditions, marital status, number of paid hours, and type of work are all important factors to consider when disentangling the effects of employment on health (Arber, 1985). Interactions with employment have been observed when marital status (Dickenson, 1992), occupation, and domestic conditions (Arber, 1991; Bartley et al., 1992) have been examined. It is evident that the living and working conditions of women need to be considered when exploring the effects of employment status and occupation on health.

This study's results make it difficult to interpret the effect of occupation on health in women. The cross-tabulations show that there is a relationship, yet the multiple regressions indicate that there is no independent contribution from occupation that is not already explained by the other variables. Occupation was also the only SES variable that did not exert a significant effect on health when the three SES variables were controlling for one another; thus, it is possible that the association between occupation and health may be spurious. In the "real world," however, we do not control for the effects of education and income. We examine the links to health of various factors that exist in the population. One of the findings from this study is that self-rated health varies with occupation. Thus, occupation can be described as a determinant of health for Canadian working women, with women at the upper end of the occupational classification experiencing better health than those below.

The Relationship Between SOC and Self-Rated Health

The findings from this study reveal a significant association between SOC and self-rated health. The bivariate correlation between SOC and self-rated health ($r = .275$, $p < .01$) was slightly higher in this study than the correlation ($r = .21$) reported by Hood et al. (1996) using data from NPHS household respondents age 18 and over (including males), but was generally consistent with the correlation of health measures reported in other studies (Antonovsky, 1993; Carmel et al., 1991).The multivariate analysis indicated that the relationship between SOC and self-rated health remained even after controlling for the effects of SES, marital status, and age. When self-rated health was regressed on the study variables, SOC contributed relatively more to the explained variance than did any other study variable.

Antonovsky (1996b) queried whether "there was a linear effect in SOC, or if having a particularly weak SOC (or a particularly strong) SOC is what matters" (p. 16). Those with high SOC (74.9%) were more likely than those with medium (65.5%) or low SOC (45.2%) to describe their health as 'excellent' or 'very good,' and the converse was true for those reporting 'fair' and 'poor' health. These results suggest that there is a SOC/health gradient, but this analysis cannot rule out a threshold effect because the differences between low SOC and medium SOC were greater than the differences between medium and high SOC. The strength of this effect will also vary with the cutoff points used to determine the SOC levels.

Although the results from this study may provide further support for Antonovsky's (1987) contention that SOC is a determinant of health, there are several other possible explanations for this finding. One explanation for the positive association between SOC and health is that poor health is a determinant of the SOC level. Another study using the NPHS data has shown a correlation between pain and SOC (McClennon-Leong, 1997). The more pain that one experiences, the lower the SOC level. It is plausible, therefore, that illness or poor health is a burden that has a deleterious effect on

SOC, a relationship that was not modeled in this study. Alternatively, the positive relationship between SOC and health may be the result of a spurious association with variables not in the regression. For example, sense of control, a construct theoretically similar to (Antonovsky, 1987) and potentially correlated with SOC, is also related to self-rated health (Lachman & Weaver, 1998). Constructs that are correlated with SOC, such as self-esteem (Nyamathi, 1991), depression (Beaudet, 1996), and anxiety (Flannery & Flannery, 1990), may also be part of the explanation for the SOC and health association.

The purpose of this study was not to provide causal explanations for the SOC and health relationship; nevertheless, these alternative explanations for the observed relationship highlight the importance of more studies to investigate the mechanism of the effect of SOC on health. Clearly, longitudinal studies are necessary to identify this effect because the cross-sectional nature of this and other studies precludes the establishment of causal order.

Although empirically the evidence for a causal relationship may be lacking (Geyer, 1997), Antonovsky (1987) suggested that a strong SOC is critical to successful coping with the inescapable stressors of life and, by extension, to health maintenance. This study was unable to support or refute this speculation because it did not address the coping measures or the neuroendocrinological mechanisms thought to mediate the SOC and health relationship (Antonovsky, 1987, 1996a; Nyamathi, 1993). The persistent findings of a positive association between SOC and health, however, warrants further investigation.

Is SOC an Intervening Variable in the SES and Health Relationship?

The first research question explored the role of sense of coherence (SOC) as a variable that mediates or intervenes in the socioeconomic status (SES) and health relationship. The results of this study lend support to the hypothesis that socioeconomic status shapes SOC, which in turn influences health.

The postulation of societal structural sources of SOC was sparked by Antonovsky's (1987) belief that the "stressors that inhibit the SOC and the GRRs that enhance it" (p. 94) are not randomly distributed in societies. This study supports his hypothesis that SOC varies with social groups, because SOC was found to differ with household income adequacy, educational attainment, and the occupation of Canadian women. The next section discusses the role of SOC as a mediator or intervening variable for each of the three relationships: income and health, education and health, and occupation and health.

SOC as a Mediator in the Income and Health Relationship

Determination of the effects of income on self-rated health revealed that 16% of income's total effect on health was mediated through SOC. SOC continued to mediate a portion of the effects of income on health (11.6%) when education and occupation were added to the regressions. Part of the explanation for these findings is the relationship between income and SOC.

This study revealed a positive relationship between income adequacy and SOC. The greater the income, the higher the SOC. The mean level of SOC increased with each of the five household income adequacy categories, and income and SOC were significantly correlated ($\underline{r} = .161$). Very little research was found regarding the relationship between income and SOC, but the direction of the relationship found in this study is the same as that found in another study of adults based on the NPHS data (Hood, Beaudet, & Catlin, 1996). In my study, when SOC was used as a dependent variable, the positive relationship between income and SOC remained after controlling for the effects of age, marital status, education, and occupation.

Why are income and SOC related? This study was unable to untangle the relationship of SES with the three components of SOC (manageability, comprehensibility, and meaningfulness), but it is reasonable to suggest that income is related to all three components of SOC.

Adequate income may provide "opportunities to influence the events that affect their lives" (Lachman & Weaver, 1998, p. 764). The ability to shape life experiences that financial resources can provide may enhance the perception that life is predictable (sense of comprehensibility), and it may allow for participation in meaningful pursuits (sense of meaningfulness). There are many financial obstacles for women that prevent them from obtaining employment in a more satisfying job, making decisions to return to school, or even enrolling in a community continuing education class, all of which are activities that might increase their SOC.

The positive relationship found in this study between household income adequacy and SOC may also be related to the perception that there are financial resources at one's disposal, thereby enhancing the sense of manageability. Economic hardship has been linked with a low sense of control (Lachman & Weaver, 1998; Ross & Wu, 1995), a construct that shares some similarities with the SOC component of manageability (Antonovsky, 1987; Sullivan, 1993). Certainly, the greater number of "undesirable financial events" (McLeod & Kessler, 1990, p. 163), such as job losses and the inability to pay bills or feed the family, to which low-income women are subject, may indeed lead to a 'load imbalance.' It may be an understatement to describe the overwhelming life circumstances that some low-income women encounter as not being conducive to a sense of manageability, comprehensibility, and meaningfulness. These speculations provide possible explanations for the link between income and SOC which was observed in this study.

SOC was found to mediate some of the effects of income on health; thus it can be considered an intervening variable. It is not clear if it is the psychosocial effects associated with income adequacy or the purchasing power and material benefits that accompany income or both which contribute to health (Wilkinson, 1996). The observation from this study that SOC intervenes in the relationship between income and health, however, supports the notion that the psychosocial effects of income adequacy on health are relevant. But clearly, the proportion of income's total effect on health which was mediated through SOC was small. This small, indirect effect is only further evidence that the exact mechanism of the effect of income in the SES-health relationship is unknown. The findings indicate, however, that most of the effect of income on health is a direct effect, reaffirming that income is a fundamental determinant of health which probably affects health through multiple mechanisms (Link & Phelan, 1995).

SOC as a Mediator of the Education and Health Relationship

SOC was also found to mediate the education and health relationship. Depending on the number of SES indicators included in the regression equation, and controlling for marital status and age, between 18.3% and 20% of education's total effect on self-rated health was through SOC. Education was the SES variable that had the strongest effect on SOC in the regression analysis when controlling for all the other variables. Consequently, of the three SES indicators, education was the variable that exerted the greatest total effect on self-rated health when the indirect effects of education on health through SOC were considered. These findings underscore education's influence on SOC.

Of the three SES indicators, education had the lowest correlation with SOC yet explained the most variance in SOC when used as the sole SES indicator and in combination with income and occupation. The standardized regression coefficient ($\beta = .125$) of the education variable was greater than the bivariate correlation between SOC and education ($r = .103$). Age, negatively correlated with education, may be suppressing the effect of education on SOC in the zero order correlation, and the standardized regression coefficient may appropriately reflect the causal effect (Cohen & Cohen, 1983).

Nyamathi (1993), in her study of minority women at risk for HIV, did not find a correlation between education and SOC. One explanation for her finding is that any beneficial influence of education on SOC is overshadowed by the personal and economic circumstances experienced by Nyamathi's sample of women. However, Nyamathi hypothesized that SOC may not be shaped by the skills acquired through education.

In this study, evidence was found to support the postulated relationship between education and SOC, and arguments can be made for a theoretical basis for this relationship. Analytical skills, logic, and the ability to gather information, interpret, and solve problems are skills acquired through education (Ross & Wu, 1995). These resources may enhance the perception that the encountered stimuli are "structured, predictable, and explicable" (Antonovsky, 1987, p. 19) and that one has the skills and information to deal with demands. The social connections and social support that are also related to education (Ross & Wu, 1995) may nurture a sense of purpose. Thus, education may affect the comprehensibility, manageability and meaningfulness components of SOC.

To tap the sense of manageability, the SOC questionnaire includes a question that asks the respondent about feeling like a "sad sack or loser" (Antonovsky, 1987), a feeling that may be experienced more often in those with little education. Self-esteem (Nyamathi, 1991) and a sense that one can successfully master or control one's experiences, or a sense of control (Ross & Wu, 1995) have been found to be diminished in those with little education. This study revealed that the mean of the SOC value generally increased with educational categories; however, the SOC mean of those who did not complete postsecondary education was lower than the mean of those who had completed high school (although not statistically significant). A significant difference in SOC means was found, however, between the women who had some community college and those who had completed community college. Perhaps the sense of failure which might accompany incomplete education has an impact on the sense of manageability. Thus, SOC may not be related to the number of years of education, but to the completion of programs, or both.

SOC as a Mediator in the Occupation and Health Relationship

In the third relationship examined, SOC was found to mediate the occupation and health relationship. Sense of coherence mediated 19.7% of the effect that occupation had on health, controlling for marital status and age. This was greater than the indirect effect through SOC of either income or education. Furthermore, because occupation did not have a significant direct effect on health when controlling for all other variables, it was only the indirect effect of occupation through SOC that influenced self-rated health. All of the effect of occupation on health was mediated through SOC, although this effect was very small.

The positive relationship between SOC and occupation was evident in this study. Generally speaking, the higher the occupation on the Pineo socioeconomic classification scale, the greater the SOC. This confirms the work of George (1996), who found significant differences between the SOC of four groups based on the occupations of home health field workers. A concern with the George study, however, was the failure to control for the effects of education and income. In my study, when education and income were controlled, occupation remained a significant contributor to the variance in SOC. Based on these findings, occupation may be considered a determinant of SOC.

Antonovsky (1987) hypothesized that work conditions, and perhaps more important, the historical/cultural context of the work, are pertinent to the development of SOC. Although this study did not address the work environment associated with the occupational categories, the results showed that different occupations had different SOC levels. It is plausible that unskilled/semiskilled workers, the occupational group with the lowest SOC mean, may experience work demands that exceed their resources, job insecurity, unpredictability, and little opportunity for the use and development of new skills (Evans, 1994; Kaufert, 1996). It is also feasible that professionals, the occupational group with the highest SOC mean, are able to balance their work demands, understand job expectations, and participate in decision making in jobs that are socially valued. Occupational categories may be a proxy for the work conditions and job characteristics that structure the experiences influential to SOC.

The individual's position in the occupational hierarchy, however, may be only a crude indicator of the conditions important to the formation of SOC. Occupation explained only a small proportion of the variance in SOC. The location on the occupational hierarchy did not consistently predict the SOC level. Farmers, ranked in the middle of the occupational classification, were the occupational group with the highest

SOC mean (60.72). It is difficult to estimate the degree of meaningfulness, manageability, or comprehensibility that a farmer experiences simply on the basis of location in the occupational classification.

Even though the specific aspect of the job that is influential to SOC is currently empirically unknown, the results from this study support the notion that particular occupations have either SOC-enhancing or SOC-inhibiting characteristics. The job characteristics that Antonovsky (1987) hypothesized to shape SOC—involvement in socially valued decision making, decision latitude (skill discretion and authority over decisions) and job security—are also being investigated as factors influential to the occupation and health relationship (Hibbard & Pope, 1985; Marmot & Theorell, 1988; Wilkinson, 1996). Meaningful work has also been described as a prerequisite for health (CPHA, 1997), which is congruent with Antonovsky's contention that participation in an enterprise that is socially valued will foster a sense of meaningfulness, the motivational component of SOC central to the theory of salutogenesis. It is perhaps not surprising that SOC was found in this study to mediate the occupation and health relationship.

Age and Marital Status as Predictors of SOC

Antonovsky (1996a) challenged researchers to use SOC as a dependent variable. Results from the path analysis provided information about the predictor variables important to SOC. The relationships between SOC and the SES variables revealed that SOC varies with socioeconomic status, which has already been discussed. The relationship between SOC and the control variables of marital status and age were also significant.

One of Antonovsky's (1987, 1996a) postulates of the development of SOC was that SOC would be stabilized after the first decade of adulthood. The relative stability of SOC, however, has not been empirically tested (Antonovsky, 1996b; Geyer, 1997). If Antonovsky's assumption of stability is correct, there should be little association between age and SOC. This study, however, found that age and SOC were positively correlated ($r = .112$, $p < .01$) and were also significant in the regression analysis which controlled for marital status and SES. The older cohorts had a stronger SOC than did their younger counterparts. This positive but small relationship between age and SOC has also been noted in other studies (George, 1996; Hood et al., 1996; Ryland & Greenfeld, 1991). In summary, a positive correlation between age and SOC has been reported in populations that include individuals past the first decade of adulthood. Further longitudinal study is necessary to establish the stability of SOC over years.

This study also revealed a positive relationship between marital status and SOC which held when the effects of age and SES were considered. Thus, at any stage of life or in any socioeconomic circumstances, married or common-law women experienced greater SOC. The relationship between marital status and a sense of manageability, comprehensibility, and meaningfulness in women is unknown; however, marital status may in some way shape the life experiences conducive to a strong SOC.

Summary

The results from this study indicate that SOC mediates a small proportion of the effect of the SES variables on self-rated health. Although no studies were found which also examined this question, the literature supported the role of psychosocial resources as mediators in the SES-health relationship (Adler et al., 1994; Lachman & Weaver, 1998; Marmot & Theorell, 1988; Ross & Wu, 1995; Williams, 1990). Williams described psychosocial factors such as health practices, social ties, perceptions of control, and stress as the "patterned response of social groups to the realities and constraints of the external environment" (p. 82). As intervening variables of the SES and health relationship, these psychosocial factors provide a way of understanding how differentials in health are created. From this study, it was determined that one of the pathways through which the SES variables influence health is through SOC. This study has shown that SOC is another psychosocial factor that, along with those identified by Williams, mediates the SES and health relationship in women when SES is measured by each of the indicators of income, education, and occupation.

Does the SES and Health Relationship Vary as a Function of SOC?

Two methods were used to explore the role of SOC as a variable that interacts with socioeconomic status to moderate the socioeconomic status and health relationship. SOC was not found to interact with income and education to vary the SES and health relationship. However, the results showed that SOC did interact with occupation. At low levels of SOC, occupation did not influence health. At higher levels of SOC, an increase in occupation resulted in greater self-rated health. However, the difference, although statistically significant, was very small.

Sometimes the term *buffer* is used when discussing interaction effects. The role of SOC as a buffer has been previously explored, but with inconsistent results (Flannery & Flannery, 1990; Nyamathi, 1991). In this study, SOC was considered to have a buffering effect if two criteria were met: (a) evidence of an interaction with the SES variables, and (b) evidence of SOC's greater protective effect on health at lower SES levels (Cohen & Wills, 1985; Wheaton, 1985). Although occupation interacts with SES, SOC had a health-boostering effect at high occupational levels, not low. Therefore, based on this definition, the results did not support the premise that SOC could buffer the effects of lower levels of income, education, or occupation on self-rated health. In summary, the findings lend support for Antonovsky's (1996b) speculation that SOC makes direct and roughly equal contributions to health for all persons. The one observed exception to this premise occurs among occupational groups.

In an attempt to understand these unanticipated findings, the hypothesized mechanism for the effect of SOC on health needs to be considered again. Antonovsky (1996b) stated that "the person with a strong SOC, believing that she or he understands the problem and sees it as a challenge, will select what is believed to be the most appropriate tool for the task at hand" (p. 172). A possible explanation for the failure to detect a buffering effect is that there are very few resources to select and utilize if one is at the lowest SES levels. Thus, the effect of the strong SOC is the most evident at occupational levels that provides resources at one's disposal to deal with encountered situations (Geyer, 1997).

It is difficult to explain, however, why this effect was apparent only in occupation and not in income or education. It may be that the GRRs important to both health and SOC accompany the working conditions of the higher occupational categories. These particular GRRs may not be related to income or education. Socially valued work, participation in decision making, and decision latitude may be examples of resources that have been shown to be important in the occupation and health relationship (Marmot & Theorell, 1988) as well as theoretically linked with SOC (Antonovsky, 1987). These resources, all linked with a sense of meaningfulness, are thought to be associated with the higher occupational categories. Perhaps it is this particular component of SOC (sense of meaningfulness) that is tapped by the experiences of those at the higher rung of the occupational ladder.

In short, the results of this study indicate that the relationship between occupation and health varies with the level of SOC, but SOC does not buffer the deleterious effects of low SES on health. Instead, a high SOC level has a salutogenic effect, particularly at high occupational levels. The aspects of the working conditions that are relevant to health, a strong SOC, and high occupational status can be speculated. These occupational characteristics may be conducive to a sense of meaningfulness, which is thought to be important to a strong SOC. However, any interpretation of this data must take into consideration the very small effect size of the interaction between occupation and health.

Study Limitations

A major shortcoming of this study is the use of a cross-sectional survey. The direction of causality cannot be determined through statistical analysis of data collected at one point in time. This is a consideration in describing the relationship between SES and health, and particularly the relationship between SOC and the other variables. Subsequent to the publication of the Orientation to Life Questionnaire by Antonovsky (1987), there have been several studies that included the SOC construct, yet few have been longitudinal, and none have determined the causal relationship between SOC and health or the stability of the SOC construct (Antonovsky, 1993; Geyer, 1997). This study was able to support the proposed causal modeling, but it does not eliminate the possibility that these same data may also validate other causal models. Other explanations for the findings, such as the reciprocal relationship between SOC and health, cannot be refuted in this study.

Theoretical consideration was given to the selection and the number of variables used in this study. Because the purpose of this study was not to predict SOC or health, but to describe the relationship among the three constructs of SES, SOC, and health, only a few variables were used. There is a risk, however, that the regression coefficients may be inflated with the omission of variables that are either correlated with the predictor or dependent variables (Pedhazur, 1982). The models were also unable to detect spurious relationships between the variables. The correlation between the variables may be related to relationships to the variables not included in the model.

This study was confined by the use of the variables within the NPHS 1994-95 survey and, more specifically, to those released for public use. Other socioeconomic status indicators might have been beneficial to this study. The NPHS survey captured only the availability of resources and circumstances at the present time rather than from periods which may have been influential in the SOC development. The income adequacy, educational attainment, and occupation of one's family of origin might also be contributing socioeconomic factors to SOC, if the experiences from the early years of life are important to the development of SOC (Antonovsky, 1996b).

This study was also limited by the derived occupation variable that included only responses from those women who had worked in the previous 12 months. Therefore, the findings involving the occupation variable are generalizable only to working women, and the extent to which previous occupation influenced SOC or health in Canadian nonworking women is not known.

The SOC variable was a derived variable from the SOC-13 questionnaire, and only the total SOC score was released for public use. This is consistent with Antonovsky's (1993) contention that the scale measures the SOC construct as a global orientation, not the individual components of comprehensibility, manageability, or meaningfulness. One consequence of this was the inability to explore the particular components of SOC that may be related to self-rated health, income, education, or occupation. Another limiting factor in the SOC scale used in the NPHS is the scoring of the items with anchors of 0 and 6 rather than 1 and 7 as suggested by Antonovsky (1987). This precludes accurate comparison of SOC levels with other populations and groups that are reported in the literature. Only comparisons with groups from the NPHS data or from those using the same scale can be made.

Recommendations for Future Research

There is a paucity of research using the SOC variable in longitudinal studies. Is SOC stable after the first decade of adulthood, or can economic and personal circumstances modify sense of manageability, comprehensibility, and meaningfulness? Is health a life experience that influences SOC? Longitudinal studies may aid in determining causal ordering. Fortunately, the NPHS has a longitudinal component, and examination of future NPHS cycles that utilize the SOC construct is recommended.

This study explored the role of SOC as a moderator of the SES and health relationship. SOC was originally conceived as a construct that explains how individuals manage stress and stay well (Antonovsky, 1987). SES was used in this study to represent the personal and economic circumstances which determine the extent of stressful life conditions. The results did not detect an income and education interaction with SOC and identified only a small interaction effect between occupation and SOC. SOC may be a moderator, however, when other more proximal measures of stress are used. Future research should consider using variables that operationalize work stress or financial stress.

Additionally, this study has highlighted the need for more Canadian research that addresses occupational status in women. Specifically, research should be conducted that addresses the relationship of SOC and health to the conditions of the work place environment, the degree of participation in socially valued decision making, and the social value of the work. Future research should also utilize occupational variables that capture previous occupation, a factor particularly relevant to occupational studies with women.

Finally, there is a need for qualitative work that could elucidate some of the quantitative findings. In-depth interviews may be necessary to understand what it is about income, education, and occupation that contributes to meaningfulness, manageability, and comprehensibility.

Implications for Nursing Practice

This study adds to the growing evidence of the relationship between socioeconomic status and health, lends support for a relationship between SOC and self-rated health, and describes the social patterning of sense of coherence in Canadian women. Therefore, the results of this study give support for public health interventions that target the socioeconomic conditions that influence health, and for strategies that foster the development of a strong sense of coherence.

The inherent danger in the identification of another psychosocial construct that intervenes in the SES/health relationship is that it may give undue emphasis to this factor rather than to the fundamental cause of the health inequities (i.e., SES) (Link & Phelan, 1995). Wilkinson (1996) stated that "when trying to explain the effects of socioeconomic circumstances on health, psychosocial factors are relevant only to the extent that they are responses to those circumstances" (p. 181). The recognition that salutogenic factors, such as SOC, are patterned by social, political, and economic forces should only underscore the importance of health promotion strategies that focus on the social and environmental context in which individuals live, rather than on individuals themselves (Labonte, 1993; Link & Phelan, 1995).

A socioenvironmental approach to health promotion considers the social and environmental living conditions as prerequisites to health (Labonte, 1993; Reutter, in press; WHO, 1986). Moreover, this approach considers these living conditions to influence psychosocial factors (such as SOC). Antonovsky (1996a) stated that a salutogenic orientation to health promotion should ask the question "What can be done in *this community* [emphasis mine] . . . to strengthen the sense of comprehensibility, manageability, and meaningfulness of the persons who constitute it?" (p. 16). As living and working conditions improve for Canadian women, so does the availability of resources, which are key to the development of SOC.

The socioeconomic status and health relationship is a relationship not unfamiliar to public health professionals. Public health nurses witness the living and working conditions of those in the most disadvantaged level of the socioeconomic status hierarchy, and are aware of the social, political, and economic forces that influence health (Blackburn, 1991;Butterfield, 1990). These experiences have fostered health promotion strategies that focus on the personal level to address immediate concerns, and on the community level to advocate for structural change (Labonte, 1993; Reutter, in press; Stevens & Hall 1992).

The public health nurse's contact with families, small groups, and communities provides various opportunities to shape life experiences (CPHA, 1990; Reutter, in press). Strategies to foster experiences that provide consistency, underload-overload balance, and participation in socially valued decision making for individuals throughout life's continuum should be considered.

Traditionally, the public health nurse has provided education and support to families. If the experiences in the early years of life are critical to human development (Hertzman, Frank, & Evans, 1994), as well as to the development of a strong sense of coherence (Antonvosky, 1987), then this lends support for the public health nursing activities that target young families. Examples of these activities include home visits to new-parents and low-income families, and early intervention programs that assist children and families experiencing personal and economic crises. Programs that offer opportunities and resources may nurture a sense of manageability, comprehensibility, and meaningfulness.

Community development approaches that foster community participation and empowerment are strategies that are increasingly being used by public health professionals (Labonte, 1993). There are many benefits arising from community projects, such as community gardens, collective kitchens, and Healthy Communities projects. Community development projects may be considered as 'SOC enhancing' and 'health-enhancing' as participation in socially valued decision making is fostered. Community empowerment may also lead to changes in the environment or health conditions (Wallerstein, 1992).

However, it is perhaps at the level of public policy that the socioeconomic environment can best be addressed. The public health community is challenged to stimulate public debate about polices that can address social and economic issues (CPHA, 1997; Drevdahl, 1995; Reutter & Williamson, in press). The Canadian Public Health Association (1997) stated that "the first priority of healthy public policy must be to ensure all Canadians have access to adequate amounts of nutritious foods, adequate housing, meaningful work and adequate income, and that all Canadians have basic literacy skills and health knowledge." Public health nurses can advocate for policy change that influences health through their involvement in intersectoral committees at the community level and through professional organizations (Reutter, in press).

Public policies that relate to socioenvironmental factors include income security programs (employment insurance, social assistance, workers' compensation, child tax benefits), affordable housing, and universal and accessible health care services (CPHA, 1997). Socioeconomic inequalities can also be affected by public policies that encourage investment in education, life-long learning, on-the-job training, and skill development (CPHA, 1997; Najman, 1993; Ross & Wu, 1995). Policies that facilitate a return to school or work after childbearing, such as the provision of affordable, high-quality child care, are particularly relevant to women (CPHA, 1997). Labor legislation that addresses minimal wages and benefits (CPHA, 1997) also has implications for Canadian women in low-paying jobs.

Conclusion

This cross-sectional study added to the knowledge of the determinants of health in Canadian women. Evidence was found of a direct effect of income, education, and occupation on self-rated health in women, as well as a small indirect effect through SOC. Thus, this study provided empirical support for another psychosocial variable that mediates the SES and health relationship. Sense of coherence, however, was not found to function as an interactive buffer to ameliorate the adverse effects of low SES on health. In keeping with Antonovsky's (1987) belief in a salutogenic effect of sense of coherence, SOC was found to have a protective effect on health regardless of SES. These findings point to the need for further research that explores this relationship using longitudinal studies and qualitative methods. The results of this study, however, suggest that public health nursing interventions should be targeted to enhancing socioenvironmental conditions that contribute to both SOC and health.

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APPENDIX A

SENSE OF COHERENCE SCALE (DVSC194)

Interviewer: Next is a series of questions relating to various aspects of people's lives. For each question please answer with a number between 0 and 6. Take your time to think about each question before answering.

SCOH-Q1: In this question 0 means *seldom* or *never* and 6 means *very often.* How often do you have the feeling that you don't really care about what goes on around you? (*reverse scored)*

0 Very seldom or never

6 Very often

DK, R (Go to next section)

SCOH-Q2: In this question 0 means *it has never happened* and 6 means *it has always happened.* How often in the past were you surprised by the behavior of people whom you thought you knew well? (*reverse scored)*

0 Never happened

6 Always happened

SCOH-Q3: In this question 0 means that *it has never happened* and 6 means *it has always happened.* How often have people you counted on disappointed you? (*reverse scored*)

0 Never happened

6 Always happened

SCOH-Q4: In this question 0 means *very often* and 6 means *very seldom* or *never*. How often do you have the feeling you're being treated unfairly?

0 Very often

6 Very seldom or never

SCOH-Q5: In this question 0 means *very often* and 6 means *very seldom* or *never*. How often do you have the feeling you are in an unfamiliar situation and don't know what to do?

0 Very often

6 Very seldom or never

SCOH-Q6: In this question 0 means *very often* and 6 means *very seldom* or *never*. How often do you have very mixed-up feelings and ideas?

0 Very often

6 Very seldom or never

SCOH-Q7: In this question 0 means *very often* and 6 means *very seldom* or *never*. How often do you have feelings inside that you would rather not feel?

0 Very often

6 Very seldom or never

SCOH-Q8: In this question 0 means *very seldom* and 6 means *very often.* Many people—even those with a strong character—sometimes feel like sad sacks (losers) in certain situations. How often have you felt this way in the past? *(reverse scored)*

0 Very seldom or never

6 Very often

SCOH-Q9: In this question 0 means *very often* and 6 means *very seldom* or *never*. How often do you have the feeling that there's little meaning in the things you do in your daily life?

0 Very often

6 Very seldom or never

SCOH-Q10: In this question 0 means *very often* and 6 means *very seldom* or *never*. How often do you have feelings that you're not sure you can keep under control?

0 Very often

6 Very seldom or never

SCOH-Q11: In this question 0 means *no clear goals or purpose* and 6 means *very clear goals and purpose.* Until now your life has had no clear goals or purpose, or has it had very clear goals and purpose?

0 No clear goals or no purpose at all

6 Very clear goals and purpose

SCOH-Q12: In this question 0 means *you overestimate or underestimate importance* and 6 means *you see things in the right proportion.* When something happens, do you generally find that you overestimate or underestimate its importance, or do you see things in the right proportion?

0	Overestimate or underestimate its importance
6	See things in the right proportion

SCOH-Q13: In this question 0 means *a source of great pleasure and satisfaction* and 6 means *a source of pain and boredom.* Is doing the things you do every day a source of great pleasure and satisfaction or a source of pain and boredom? *(reverse scored)*

0	A great deal of pleasure and satisfaction
6	A source of pain and boredom

APPENDIX B

DERIVED HIGHEST LEVEL OF EDUCATION OBTAINED (DVEDC294)

1. No schooling
2. Elementary
3. Some secondary
4. Secondary
5. Some trade, technical, vocational school, or business college
6. Some community college, CEGEP or nursing school
7. Some university
8. Diploma or certificate from trade, technical, or vocational school; or business college
9. Diploma or certificate from community college, CEGEP, or nursing school
10. Bachelor's or undergraduate degree or teacher's college (BA, BSc, LLB)
11. Master's degree (e.g., MA, MSc, MEd)
12. Degree in medicine, dentistry, veterinary medicine, or optometry (MD, DDS, DMD, DVM, OD); earned doctorate (e.g., PhD, DSc, EdD)

APPENDIX C

INCOME ADEQUACY IN FIVE DISCRETE CATEGORIES (DVINC594)

This variable is based on household income and the size of the household.

Code	Description	Income	HH size
1	Lowest income	Less than $10,000	1 to 4 persons
		Less than $15,000	5 or more persons
2	Lower middle income	$10,000 to $14,999	1 or 2 persons
		$10,000 to $14,999	3 or 4 persons
		$15,000 to $29,999	5 or more persons
3	Middle income	$15,000 to $29,999	1 or 2 persons
		$20,000 to $39,999	3 or 4 persons
		$30,000 to $59,999	5 or more persons
4	Upper middle income	$30,000 to $59,999	1 or 2 persons
		$40,000 to $79,999	3 or 4 persons
		$60,000 to $79,999	5 or more persons
5	Highest Income	$60,000 or more	1 or 2 persons
		$80,000 or more	3 persons or more
9	Unknown	Not stated	Not applicable

APPENDIX D

PINEO SOCIO-ECONOMIC CLASSIFICATION OF OCCUPATION (DVPIN94)

1	Self-Employed Professional
2	Employed Professional
3	High-Level Management
4	Semiprofessional
5	Technician
6	Middle Management
7	Supervisors
8	Forewomen
9	Skilled Clerical/Sales/Services
10	Skilled Crafts/Trades
11	Farmers
12	Semiskilled Clerical/Sales
13	Semiskilled Manual
14	Unskilled Clerical/Sales/Services
15	Unskilled Manual
16	Farm Laborers
96	Not Applicable
99	Not Stated

Marmot, M., & Theorell, T. (1988). Social class and cardiovascular disease: the contribution of work. The social production of disease and illness (pp. 93-105).

McClennon-Leong, J. (1997). Alternative health care provider use in chronic non-malignant pain population. Unpublished master's thesis, University of Alberta, Edmonton.

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APPENDIX A

SENSE OF COHERENCE SCALE (DVSC194)

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DK, R (Go to next section)

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0 Overestimate or underestimate its importance

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6 A source of pain and boredom

APPENDIX B

DERIVED HIGHEST LEVEL OF EDUCATION OBTAINED (DVEDC294)

1. No schooling
2. Elementary
3. Some secondary
4. Secondary
5. Some trade, technical, vocational school, or business college
6. Some community college, CEGEP or nursing school
7. Some university
8. Diploma or certificate from trade, technical, or vocational school; or business college
9. Diploma or certificate from community college, CEGEP, or nursing school
10. Bachelor's or undergraduate degree or teacher's college (BA, BSc, LLB)
11. Master's degree (e.g., MA, MSc, MEd)
12. Degree in medicine, dentistry, veterinary medicine, or optometry (MD, DDS, DMD, DVM, OD); earned doctorate (e.g., PhD, DSc, EdD)

APPENDIX C

INCOME ADEQUACY IN FIVE DISCRETE CATEGORIES (DVINC594)

This variable is based on household income and the size of the household.

Code	Description	Income	HH size
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		Less than $15,000	5 or more persons
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		$10,000 to $14,999	3 or 4 persons
		$15,000 to $29,999	5 or more persons
3	Middle income	$15,000 to $29,999	1 or 2 persons
		$20,000 to $39,999	3 or 4 persons
		$30,000 to $59,999	5 or more persons
4	Upper middle income	$30,000 to $59,999	1 or 2 persons
		$40,000 to $79,999	3 or 4 persons
		$60,000 to $79,999	5 or more persons
5	Highest Income	$60,000 or more	1 or 2 persons
		$80,000 or more	3 persons or more
9	Unknown	Not stated	Not applicable

APPENDIX D

PINEO SOCIO-ECONOMIC CLASSIFICATION OF OCCUPATION (DVPIN94)

1	Self-Employed Professional
2	Employed Professional
3	High-Level Management
4	Semiprofessional
5	Technician
6	Middle Management
7	Supervisors
8	Forewomen
9	Skilled Clerical/Sales/Services
10	Skilled Crafts/Trades
11	Farmers
12	Semiskilled Clerical/Sales
13	Semiskilled Manual
14	Unskilled Clerical/Sales/Services
15	Unskilled Manual
16	Farm Laborers
96	Not Applicable
99	Not Stated

APPENDIX E

NPHS AGE COHORTS (AGEGRP)

- 12 to 14 years
- 15 to 19 years
- 20 to 24 years
- 25 to 29 years
- 30 to 34 years
- 35 to 39 years
- 40 to 44 years
- 45 to 49 years
- 50 to 54 years
- 55 to 59 years
- 60 to 64 years
- 65 to 69 years
- 70 to 74 years
- 75 to 79 years
- 80+ years